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# THROUGH SCIENCE TO GOD

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Floyd L. Darrow



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Through science to God

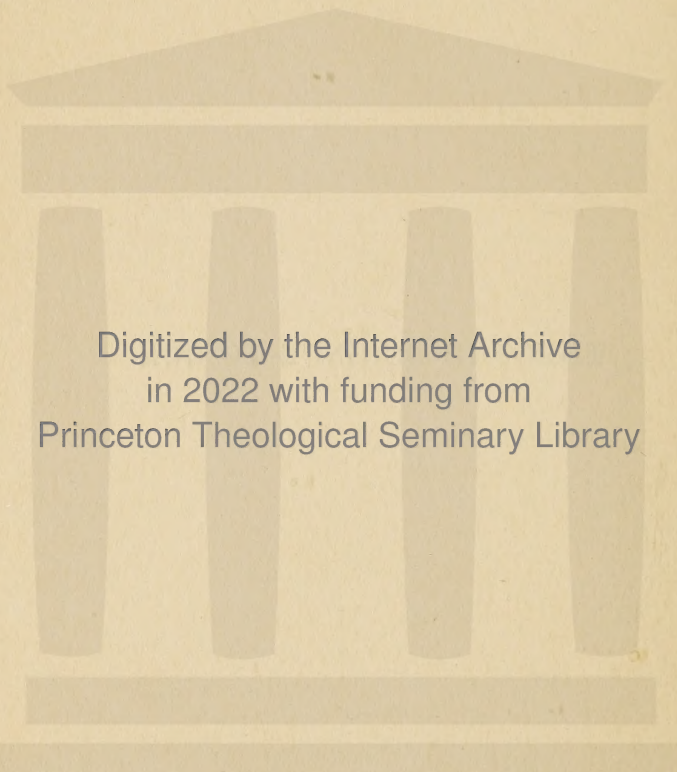








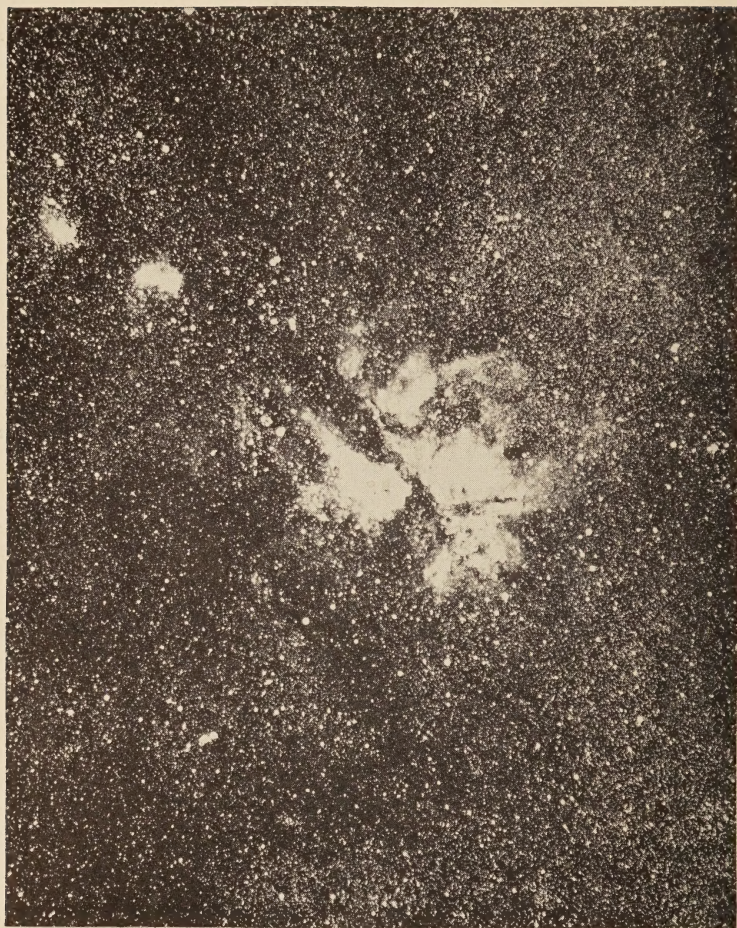
THROUGH SCIENCE TO GOD



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THE NEBULA IN CARINA

This vast whirlpool of nebular chaos contains sufficient material for many giant suns.

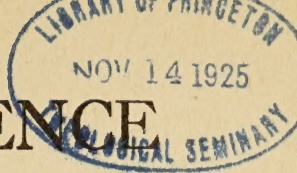
# THROUGH SCIENCE TO GOD

*By*  
FLOYD L. DARROW

*Author of*  
MASTERS OF SCIENCE AND INVENTION



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## INTRODUCTION

THROUGH SCIENCE TO GOD is an attempt to clarify the confused thought of scores of troubled souls concerning spiritual problems of fundamental significance to this life and the next. It tries to relate the everlasting spiritual truths of sacred literature to the changing forms of modern thought. Recognizing that the revolutionizing discoveries of science are as surely revelations of the Divine Immanence as ever were the words of seer or prophet, it seeks to harmonize the old and the new, to retain the rich heritage of the past and assimilate it to the never-ceasing accumulations of fresh knowledge. The notion that the divine revelations of the eternal truths of the universe ever ceased is utterly false. That God revealed all that is to be known about the origin and development of the universe to infant peoples at the dawn of history is an idea so absurd that we stand amazed at its credence by any in this marvelous age of super-science. The spectacle of grave legislators sitting in solemn council at the close of the first quarter of this twentieth century of enlightenment to pass laws prohibiting the spread of new truth and tending toward the stagnation of thought and the fossilization of error constitutes a situation which verges upon the ridiculous. It harks back to the days of Galileo and the Inquisition. Within ten years we shall wonder that it ever could have happened.

## INTRODUCTION

And still the new knowledge of evolution has proved disquieting to a host of anxious souls. They do not see their way to a belief in it and a retention of their religious faith. That evolution is simply God's way of working is not yet understood. They have not caught a vision of creation as a process of eternity, never ceasing, always rising through larger cycles to higher levels and nobler achievements. Many do not know what evolution means. They do not understand that it in no sense deprives them of their God or denies their divine origin. It is a chief purpose of this book to dispel the fogs of misconception and popular prejudice which temporarily veil the truth regarding this fundamental law of everlasting growth and progress. It is hoped that its thoughtful reading will deepen Christian faith and bring peace of spirit to many a troubled mind. That the teaching of science gives the strongest grounds for belief in God and immortality is the burden of its message.

The literal interpretation of Scripture and the man-made theology of the Middle Ages no longer harmonize with this new world of scientific discovery and ever-enlarging revelations of eternal truth. It is time the intellectual leaders of the world lay aside their groundless fears that the truth about the Bible and its origin will jeopardize the spiritual welfare of the race. The undeniable facts regarding the evolution of our sacred literature should be a part of the common information of people everywhere. Nothing can be gained by pretensions to belief in the discredited forms of religious thought.

## INTRODUCTION

In the firm conviction that the spiritual life of people will be immeasurably deepened by a proper understanding of these new view-points, a frank discussion of the Bible in the light of recent scholarship is included in these pages.

The underlying purpose of this book is religious. There is no conflict between spiritual and scientific truths. They arise from a common source. They strike their roots deep into the same subsoil of fundamental realities. Belief in one form of truth does not discredit faith in the other. And yet the great body of scientific facts, susceptible of exact verification, can not be overthrown by appeals to the literal interpretation of a sacred literature, formulated in an age of scientific ignorance and superstition. Such attempts are worse than useless. They only discredit the cause which they are intended to support. Many leaders of the church, apparently oblivious to the tremendous crisis which confronts them, fatuously seek to retain the husks of an outgrown traditionalism, rather than to square their creeds with the rapidly accumulating body of new truths. And it is undeniably true that many scientists still cling to the crass materialism of a generation ago. In the hope that protest against these false attitudes on the part of intellectual leaders will hasten the coming of that day when Christian prophet and scientist alike may unite in a common reverence for the revelations of the Divine Immanence, in whatever form they may appear, this book has been prepared.

FLOYD L. DARROW





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THROUGH SCIENCE TO GOD



# THROUGH SCIENCE TO GOD

## CHAPTER I

### FROM NEBULA TO INHABITED PLANET

FROM nebula to inhabited planet,—how glibly we say it. And yet how impossible it is even to comprehend what untold billions of years lie between us and that unthinkably remote past when all that we see about us and all that exists in the central sun and in the other members of our solar system were “without form and void,” diffused possibly in some by-path of the heavens as a thin vaporous fire mist, or nebula. For it is thought that in the infinite sweep of Time, suns and solar systems are subject to the common law of growth. They take their beginnings in the primeval chaos of disintegrated matter, evolve to maturity, and then decay, possibly again being resolved into the raw material of infant worlds, only to pass in never-ending succession through cycles of birth and growth and decline. How it staggers thought and bewilders the imagination for us ephemeral creatures of but a fraction of a cosmic moment to attempt to visualize

this drama of eternity,—perpetual change, ceaseless ebb and flow, never a flawless product, youth, maturity and old age, always rising spiral-like to larger cycles and higher levels, leading sometime, somewhere to organic life, as possibly but a passing phase of the process, and the insoluble mystery of the whither of it all! What lies back of the atoms, molecules and electrons that constitute the nebula? Are we able anywhere to detect a Divine Purpose? Does our little system of life and cosmic matter seem to be the product of a Master Mind? Or, are we and all else in the universe mere puppets of chance? Are we simply a part of a colossal mechanism of perpetual motion, requiring neither creator nor guide? And are there other worlds than ours,—myriads of them possibly? Does the universe mayhap swarm with life, even as a drop of water from a stagnant pool teems with microscopic organisms? Can we imagine the limits of creation, bounds beyond which there is no star or nebula or life or motion? These are some of the soul-perplexing questions to which we citizens of the universe would fain have answers. It may be that along some path of inquiry lies an inkling of the truth. Let us see.

Should we sweep the heavens with the telescope and possibly call to our aid celestial photography, our search would be rewarded with the discovery of hundreds of thousands of luminous cloud-like wisps of matter, dotting the night-time skies in abundant profusion. These are the *nebulæ*. They cover vast areas of the celestial spaces. The nebula



in the constellation Lyra would hold twenty-five thousand solar systems equal in size to our own. So immense are some that it would require many years for a ray of light, journeying at the rate of one hundred eighty-six thousand miles a second, to pass from side to side. The quantity of material in the vast whirlpool in Orion is sufficient to give birth to thousands of giant suns. The great nebula in Andromeda, the largest as seen from the earth and also possibly one of the nearest, is still so far away that some astronomers estimate its distance at a half million light years. That is, it would require light, at its "stage-coach" speed, a half million years to travel from that patch of luminous vapor to the earth.

The spectroscope, a marvelous instrument for the revelation of the secrets of the heavens, tells us that these nebulae consist of incandescent gases in highly rarefied form, so exceedingly rare that the gases remaining in a vacuum tube are dense in comparison. But whence the source of the light? In those vacuous spaces, it is intensely cold, probably little, if any, above absolute zero, the coldest possible temperature. This light, then, can not be due to heat. And yet, the luminosity of these attenuated gases is maintained, apparently undiminished, from decade to decade and century to century. It is altogether likely that this condition must be attributed to an electrical disturbance, similar to that of the Aurora Borealis. But, be that as it may, these nebulae are among the most numerous objects of the heavens. Many of them

are spiral, gigantic whirlpools of cosmic action in which other suns and worlds innumerable may be in the process of formation. At least that is the view which has been held by many astronomers, from Laplace to the present day.

Let us examine this Nebular Hypothesis a little more in detail. Its purpose is to account for the origin of a solar system like our own. Somewhere, somehow, sometime our little family group of central sun and attendant bodies took its beginning. What is the explanation? How did it happen and how has the matter which composes them evolved to its present form? The theory of Laplace, a brilliant French mathematician and astronomer of something more than a century ago, is briefly this: A nebula of glowing gas rotating on an axis and subject to the law of gravitation, as all matter is, would through inconceivably long periods of time contract with the evolution of heat and in so doing assume a flattened disk-like form. The diminishing size of the nebula would, as a direct result of physical laws, increase the rate of rotation until the centrifugal force equaled the gravitational pull toward the center of the mass. When this stage was reached, a large ring of rotating matter would be left behind, which, under the influence of the same laws of motion and gravitation, would be gathered into a planet revolving about the parent nucleus. This in turn, too, would throw off rings to form satellites. And then again, slowly and without haste, through countless eons, as befits the cosmic processes of eternity, other rings would be

separated from the central mass to form additional planets. When stability was finally reached, the product of this stupendous piece of creative evolution would be a solar system with a highly heated central sun and a revolving group of planetary attendants. As a by-product, out of the surplus material of this world building, swarms of meteoric matter would be left to revolve in orbits of their own about the central luminary. And comets, those erratic members of the solar family about which is associated so much of mystery but which were shown by Newton to obey the law of gravitation, at one or more points of the evolution were hurled forth on those far-flung paths which take them to such remote portions of the vast unknown, only to return at regular intervals to salute the majestic ruler of their journeyings. Slowly our earth, one of the lesser planets, cooled down sufficiently to permit the vapor in its atmosphere to condense and those elemental forces of heat and rain and wind and moving water to begin the infinitely slow process of building the continents and fashioning them for the abode of living things.

Although there are difficulties in the way of the complete acceptance of this theory, it is understandable that a solar system could be evolved in accordance with its principles. Electrons, atoms, molecules and then a luminous rotating nebula, a whirlpool of meteoric matter, followed by a central disk sloughing off gigantic rings to form a planetary group, and at length a cooling earth evolving throughout long ages into a suitable habitat for life

and eventually for the home of man,—this seems to have been the possible order of creation. The large numbers of spiral nebulae which dot the heavens, indicate that this description possesses a high degree of approximation to the truth.

Other explanations have been advanced, particularly the Planetesimal Theory of Professors Chamberlain and Moulton, of Chicago University, which builds up the planets and their satellites from meteoric dust rotating in an immense spiral whirlpool. These bodies have not been hurled off from the central nucleus, but instead represent small knots of infalling material drawn together by the force of gravitation. This meteoric matter was originally cold, and the heat of the planets has been developed, like that of the sun, by gravitational compression. The atmosphere and the water in the oceans were squeezed out of the interior of the earth during an immense period of growth and contraction. In some respects this theory fits the facts of observation better than does the older one of Laplace.

But, although it is still uncertain, and possibly always will be, as to the exact method by which our solar system has evolved, astronomers have no doubt that it took its beginning in some primitive nebula, at an inconceivably remote moment of the infinite past, and that it is leisurely taking its course through the successive stages of youth, maturity and old age. Abundant evidence of such cycles of change is written large in the heavens. Spectroscopic analysis reveals suns in every stage



of evolution from those still wrapped in nebulous matter and the giant stars of youth to the feebly flickered red dwarfs of old age and the cold dark bodies which have lived their lives and are speeding onward through space, awaiting the chance of some celestial catastrophe to resolve themselves once more into the primeval chaos of nebulous matter, only to begin anew the birth of other suns and worlds. In the vast sweep of such a cosmic cycle, may there not be at many points organic evolution with the unfolding of life in all its manifold forms, the growth and decay of cities and civilizations, human souls groping after God and immortality, and mayhap still higher and nobler phases of existence than any we have as yet experienced?

As to other worlds than ours, it would, indeed, be most unreasonable to assume that our little earth is the only spot in the universe suitable for the origin and evolution of life. Of the hundreds of millions of stars, which exist in space, thousands are known to be in the same state of evolution as is our sun. And our solar system is thought by some astronomers to be at maturity and by others just approaching old age, which, for aught we know, may be the harvest time of a star period. The heat of the sun is not increasing. It may be on the wane. Not that such diminution would be appreciable within the brief span of recorded history, for life conditions will doubtless be maintained here for many millions of years yet, but, so far as cosmic time goes, we are more than likely in the second half of our cycle. This is inferred from the character of the

sun's light. The ruler of our skies has traveled an inconceivably long way since the youthful period when it was a reddish giant, and it still has an immensely long future, before it passes completely through the reddish dwarf stage and becomes a dark lifeless body. Now, is it not highly probable that innumerable other suns in the same state of development as ours may have inhabited planets revolving about them,—scenes of life and death, struggle and triumph, sorrow and joy,—cosmic niches, as it were, in the infinite plan of creation? Of course, we can never know. But somehow, it seems as though the universe would be out of tune if the earth were the only place where evolution has flowered into life. Similar paths of cosmic development must have led to like conditions of growth and fruitage. Implicit in the Infinite Purpose which embraces all creation must be life, and life in abundance. Just as every region of the earth, the environment of which permits, teems with life, so would it seem that every sun at the proper season must become the center of numerous populations, as naturally as harvest time brings the ripened grain, or the spring-time soil sends violets up and paints them blue. Surely, life must be one of the supreme achievements of creation and our little earth but a single member of God's great republic of worlds.

And what of the bounds of space? In spite of Einstein, we can not conceive of the beginnings or the ends of space,—of a place where there is no space. Space must be infinite in extent. Each new telescope, more powerful than the last, pushes back

the frontiers of our universe by billions of miles and adds many millions of suns to our stellar population. And we say *our* universe, because many of the foremost astronomers believe that our immense family of stars is only one of many similar collections, the members of each such group constituting a cosmic unit and moving in accordance with the law of gravitation. It is entirely possible that these universes may be as numerous in space as a whole as are the stars in our own cosmic system. Giant suns, larger even than Betelgeuse, itself more than three hundred times as large as our own, may people space in the utmost profusion. What a stupendous place creation is! And how even the most momentous events of our little planet are dwarfed into insignificance in comparison with the vastness of it all! Yet may it not be true that the supreme purpose of creation everywhere is the production of life and the evolution of immortal souls? Somewhere, sometime we may understand it all, for there can be little doubt that the life which manifests in each individual will continue to evolve through endless time, just as in all probability do the matter and energy in the solar system of which we are a part. At least such a view is far and away the most probable one possible to take.

#### FASHIONING THE PLANET FOR LIFE

After our earth had become a full-fledged member of the solar system, the next stage in the process of evolution was to prepare its surface for the abiding-place of living things. How did it happen?

Whether the origin of the earth be in accordance with the Nebular Hypothesis or the Planetesimal, or with some other as yet unformulated, the first chapter of the geologic story begins with the foundation crust whose heaving surface, refashioned by the elemental forces of volcanic heat, and ocean, wind and running water, was to serve as nature's theater of action. But there was no haste. With an infinity of time at her command, Nature began the inconceivably slow changes which were to lead to continents, eventually to be clothed with vegetation and replete with animal life. The rocks\* were at first molten, seething and boiling and doubtless for ages passing alternately from lava to solid crust and back again. In this boiling process, the lighter materials rose to the top, while the heavier ones sank to form the denser core. Very gradually the surface cooled and at the same time the mass of the earth shrank in size until its diameter became what it is to-day, about seven thousand nine hundred miles. At length a temperature was reached low enough to permit the vast quantities of water vapor contained in the atmosphere to condense to form the ocean. For a long time, only here and there protruding masses of rock indicated the embryonic beginnings of continents. The ocean was shallow, no great depressions having been formed. Owing to the prevailing high temperature, prodigious quantities of water vapor passed into the clouds, only to condense and fall back as rain, part of it to gather in rivers upon the rocky nuclei of the continents and rushing seaward to bear down

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\*According to the Nebular Hypothesis.



to the shallow coastal waters sediment derived from the rocks over which they passed. Thus were the first sedimentary rocks laid down. The winds, lashing the sea with the fury of the storm, drove the waves against the shore-lines, grinding the rocks into pebbles, sand and mud, which the sorting action of water deposited in additional layers of rock. And so the continents grew.

But the crust of the earth was still far from stable. Its heaving surface rose and fell like the billows of a troubled sea, here an elevation, there a subsidence. As deeper and deeper warps occurred, the waters withdrew into them, leaving constantly larger areas of rock exposed to the action of wind and running water. And these two processes have continued to the present day, although more extensively in past geologic time than in recent. More than once dry land has disappeared below the surface of the sea, and ocean beds have been raised to become dry land. Continents and islands now separated by oceans have repeatedly been joined by bridges of land. It is not improbable that the fabled continent of Atlantis existed at one time somewhere in the north Atlantic Ocean. Abandoned beaches, now stranded far inland, tell of the locations of early geologic seas. Ancient river terraces give evidence of shifting physical features of the land and changes of elevation. But these changes have been exceedingly slow, vast periods of time being required for their execution.

And with it all mountains grew, sometimes gigantic folds thrust heavenward by the attempts

of the cold crust to fit itself to a constantly cooling and shrinking interior, sometimes a series of deep furrows eroded in the rocks through the agency of running water, and this interplay of titanic forces was frequently accompanied by the music of volcanic action, lava flows and earthquake catastrophes. The tremendous pressures and high temperatures developed in these folding and crumpling processes of mountain growth often resulted in changes in the structure of the rocks themselves.

But no sooner do mountains begin to grow than the eternal forces of destruction set out to annihilate them. Their bare and unprotected surfaces are splintered by the lightning, carved into fantastic shapes by wind and driven sand, deeply eroded by the torrential rush of running water, and burst asunder by the irresistible force of frost and ice. The debris of these ceaseless processes of decay, borne seaward by the rivers, finds a lodging place in valley, plain and delta. And thus deep soils come to cover the lowlands.

With this perpetual shifting of mountain, sea and continent, too, came climatic changes of vast proportions, one and the same region having been repeatedly the scene of tropic heat and Arctic cold. Abundant evidence of these conditions is written large in the record of the rocks.

And so this drama of geologic forces held the stage for countless eons before those peculiar conditions necessary for the production of life emerged upon the earth. But at length they came,

and when they did, the simplest forms of living organisms appeared as naturally as the flower unfolds from the bud. We may never be able to duplicate the exact conditions required for this strategic turning-point in the evolution of our planet, but we may be perfectly certain that they had their origin in the Divine Immanence of all creation. Only recently Doctor John W. Gruner, of the department of geology of the University of Minnesota, announced that he had found evidences of blue-green algæ, very primitive microscopic plants, in rocks belonging to the Archæan Age, the oldest of the geologic ages. Doctor Charles D. Walcott, secretary of the Smithsonian Institution at Washington, had already discovered organic remains in rocks of almost equal age. Certain it is that when the earth had cooled sufficiently to support life, life appeared and organic evolution began. The tale of the rock record, as revealed in its fossil populations, will be told in another chapter.

From nebula to inhabited planet has become an accomplished fact, not once only, but possibly millions of times at innumerable points of space. Ephemeral creatures of but a small portion of a cosmic instant, we can no more, in our present state of evolution, fathom the mystery of it all than can an insect in a tropic forest appreciate the vastness of his surroundings. Still, by the contemplation of the awe-inspiring grandeur of our universe and the sublime order of creation, we emancipate our earth-bound souls and grow in mental and moral stature.

## HOW OLD IS THE EARTH?

The age of the earth has been a bone of contention, both in theology and science, for centuries. But inasmuch as theology has no sources<sup>e</sup> of information other than legendary statements having their origin in the folklore of primitive peoples, we must turn to science for an answer.

A century ago, Lyell, the great Scotch geologist, announced that the same slowly acting forces which are reshaping the physical features of mother earth to-day have wrought all the vast changes of the past, from the time our planet was a molten\* sphere to the present moment. Estimates by many scientists, based upon the known rates of change in various parts of the world, have placed the age of the earth at not less than one hundred millions of years. And this conclusion does not take into account the immeasurably long periods of time comprised in the nebular period which preceded the coming into play of present geologic forces. In comparison with these, one hundred million years would comprise scarcely a tick of the cosmic time clock.

Still biologists were not satisfied. One hundred millions of years were all too short for the stupendous processes of organic evolution which the fossil record of the rocks disclosed. Nothing less than several hundred millions would suffice for the unimaginably slow changes which have occurred from the time the most primitive forms of life appeared to the highly organized fauna and

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\*It should be noted that according to Planetesimal Hypothesis the early condition of the earth was not molten.



flora of to-day. And so, many eminent biologists have extended the life-span of the earth to at least a billion years.

The astronomers and the physicists, too, have made estimates, based upon entirely different sources of information. They ask the question: How long has the radiation of light and heat from our sun been sufficient to maintain life upon this globe? For we must understand that the sun is our sole source of energy. It is rays of the sun which evaporate the water from the ocean to supply the rainfall for our lakes and rivers and waterfalls. It is the energy of the sunlight which builds starch and cellulose in the chemical laboratory of a green leaf. And it was this same energy of the sun which in a remote geologic time grew the forests for the production of coal. When the solar fires grow cold, the life cycle of our planet will have run its course. It is estimated that the earth intercepts solar energy at the stupendous rate of two hundred and thirty trillion horse-power. And yet that is but one two-billionth of the total amount radiated into space by our central luminary, the bulk of which, according to our ideas, is wasted. What maintains these fires, and how long will they continue? To compensate for this prodigious loss, there must be some source of supply, else the sun would have grown cold ages ago. What is it?

The early theories, that the heat of the sun is maintained by ordinary combustion or that the sun is simply cooling off and thus radiating into space the heat obtained in its evolution from primeval chaos, have been shown to be utterly untenable.

And so also has the idea that the solar energy is generated by the impact of meteors falling from great distances into the sun passed into the discard. The total mass of meteors is simply insufficient for any such enormous demands. For many years the most plausible explanation seemed to be the generation of heat through the contraction of the mass of the sun itself. Following the methods first employed by Helmholtz and using the most recent data regarding the sun's rate of radiation, mass and size, it has been shown that a contraction in the sun's radius of one hundred and twenty feet a year would supply a quantity of heat as great as the sun now radiates annually. And such a diminution of the sun's diameter could not be detected, even with the most powerful telescopes, for ten thousand years. Estimates of the crustal age of the earth, based upon the sun's rate of radiation, have varied all the way from Lord Kelvin's figures of one hundred million years down to twenty-five millions in more recent times.

But science seldom stands still. Researches in the wonderful field of radioactivity have increased the estimated age of the earth enormously. The biologist, who was trying to scrape along on the niggardly hundred million years doled out to him by his brother scientists, may now have almost unlimited periods of time for his processes of evolution. Without here going into the details of the methods employed, let it be said that Professor A. C. Lane, of Tufts College, chairman of the committee appointed by the National Research Council

to estimate the age of the earth by observations of the rate of atomic disintegration, as revealed by the relative amounts of radioactive elements in the earth's crust and their decomposition products, announces an age of a billion and a quarter years. Doctor H. V. Ellsworth, of the Canadian Geological Survey, from independent researches in the same field, confirms these figures.

It is highly probable, too, that the heat of the sun is maintained to a large degree by the decomposition of radioactive elements. Spectroscopic analysis of the sun's atmosphere by Sir Norman Lockyer revealed the presence of helium there in large quantities long before it was found on the earth, and helium is one of the chief disintegration products of radium. In this disintegration, enormous quantities of heat are liberated, and it may well be that in these reservoirs of sub-atomic energy science has at last solved the riddle of the celestial fires.

Certain it is that the earth is old, vastly older than the earlier estimates of science would lead us to believe. Whatever may be our ideas regarding the spiritual and theistic aspects of the universe, we must concede the immense antiquity of man's earthly abode.

#### IS THERE PURPOSE IN CREATION?

Has this stupendous process of cosmic action, this eternal pageant of creation been the result of mere chance and accident? Do we behold only a self-running mechanism of colossal proportions?

Do we see nothing but matter, force and energy? Can we imagine that our solar system, whatever the process or method, has come about without a directing agency? Has there been no thought or purpose or intelligence? These are questions which have puzzled many minds in many times.

But what do we see? A cosmic order of perfect law and harmony. "The heavens are crystallized mathematics." The members of our solar system move in their orbits with unerring precision. The universal law of gravitation demonstrates the sway of a force of such dizzy vastness as to bewilder thought in the attempt to grasp it. The atoms, too, are known to be marvelous systems of planetary units, moving in accordance with laws as unvarying as those which prevail in cosmic space. Chemical changes are always in exact numerical proportions. The molecules decompose and the atoms recombine in obedience to definite and undeviating laws. Some power has founded these systems of law and order and maintains them with unwearying and unalterable exactness. What is it,—intelligent purpose or chance? Self-directing reason or blind necessity? There are no other alternatives. Shall we assume that a power which is neither rational nor intelligent has by mere accident produced a world order of marvelous complexity and perfect harmony, one which is wholly intelligible to the human understanding, a product of its own creation, but is utterly unintelligible to itself? Can we subscribe to the doctrine that an intelligible universe can proceed from a non-intelligent source?



But more significant than all this, the whole trend of evolution from nebula to mature planet seems to look forward to the coming of life. Here, unquestionably, we seem to see purpose. Not once in a million times would it be possible for a system of nature exactly adapted to the production and maintenance of life to evolve by *mere chance*. Whence this unique and remarkable fitness? An atmosphere of precisely the correct proportions of essential elements, an ocean of wonderfully moderating influence upon temperature and climate and a natural habitat for many forms of animal life, elements and compounds whose physical and chemical properties serve the necessities of mankind and promote the growth of industries and civilizations, vast storehouses of natural wealth, seemingly inexhaustible supplies of energy, the rather narrow range of temperature within which living organisms can exist, productive soils, mechanical laws amenable to human intelligence,—all these and much more point to the advent of life as the supreme achievement in the evolution of our planet. And such a forward-looking bent running back through countless eons implies purpose. We can not escape it. Back of our world, and the universe too, must stand the thought and purpose of an intelligent creator, a Being whose life is the immanent source of all created things. Any other view is utterly unthinkable. It leads only to mental chaos.

The fact that the world-ground, or fundamental reality back of creation acts as though it had

purposes must prove that it has them and that a Supreme Intelligence informs and directs the manifestation of all natural occurrences. That is the law of science. Why do we assume an ether? Simply because it is unthinkable that light and heat energy can travel ninety-three millions of miles from the sun to the earth without something in which to travel. Until the coming of Einstein certain natural phenomena seemed utterly unintelligible without the supposition of this intangible medium. But whether it be the old reliable ether or some other hypothetical connecting bond, the mind will never rest content with a mere vacuum. Whatever is necessary to the mind's understanding of the facts, the imperial scientist will invoke. Why do we believe that the fossil record of the rocks unfolds the past history of organic life upon this planet? Because there is no other rational explanation. Why do we say that certain rocks were once molten and that others were formed by the deposit of sediments? Because their structures clearly disclose such an origin. The scientist believes implicitly in the marvelous subatomic worlds of electrons, and yet they are utterly beyond his most penetrating gaze. True, the rational necessity for their existence rests upon a wealth of experimental evidence. Nevertheless, they have sprung into being in response to our attempts to interpret the facts of nature. Very much of natural phenomena is just as unintelligible without assuming Divine Purpose as is the world of atoms without electrons. God is as much a rational

necessity to the understanding of the universe, and of our planet in particular, as are the hypotheses of the scientist to the interpretation of his facts. Still, it is not to be inferred that the idea of God is simply an hypothesis. To many of the most profound thinkers His existence is as axiomatic as that two and two are four.

## CHAPTER II

### FROM MYTH AND LEGEND TO THE REIGN OF LAW

LET us transport ourselves backward for a little time to the early centuries of the Christian Era and view the ancient world as it appeared to the simple folk of that comparatively recent period in the history of mankind. True, the seasons came and went then as now; the same ocean bathed the continents; the same heavens stretched their empyrean canopy from horizon to horizon; the same heavenly host peopled the infinite depths of space; the earth was no larger then than now; it spun on its axis and whirled about the sun with the same unerring precision of time and motion; the law of gravitation extended its sovereign sway as far as now; our solar system marched with the stars just as it does to-day; the more distant suns of the beautiful Milky Way were even then "at least a hundred thousand trillion miles away" from our little planetary group; the sunbeam, the measuring rod of the new heavens, traveling at the rate of one hundred eighty-six thousand miles a second, required, too, in that early day thousands of years to journey from farthest sun to farthest sun across our universe of stars; the atoms, molecules and electrons, imprisoning a million hoary secrets, fairy-like spun and



danced, even as they do in the scientist's laboratory to-day; the story of the rocks, ages old, lay as an open book before any who perchance might understand its language; Nature held the same vast store-houses of latent treasure; the giant steam and the untamed lightning were eager then to become the burden-bearers of the race; this ancient world possessed little to distinguish it in physical characteristics from the world to-day. But little did those youthful peoples know what vast unexplored spaces of land and sea and sky lay beyond their tiny horizon. Myth and legend were their source of knowledge. To their simple faith the little world of that day presented few problems. The mysteries of heaven and earth were far less obscure than they are to us, and chiefly, because they "knew" so much that is not so. But let us visit that ancient world and follow the crude thinking of those pioneers of "yesterday," as it evolved through ever-increasing knowledge to constantly higher and more truthful conceptions both of God and man and of the universe of which we are a part.

Could we wake up some morning in this little world of long ago, we should find it constructed in accordance with the legendary accounts of creation originating in the gray mists of Chaldean, Egyptian, Persian and other ancient civilizations. This crude cosmogony represented a curious blending of common-sense notions and purely imaginative ideas. So far as the early Christians were concerned, it drew its warrant from a host of Biblical texts, founded in turn upon these primitive legends.

Crude products of ignorance and superstition, these theories of the universe are such as might be expected from infant peoples making the first tiny explorations of the infinite depths of space.

The Chaldean account pictures a flat earth resting upon the "great waters" surrounding it and in whose depths are placed the foundations which support the solid dome of the "firmament." Within the earth is the realm of the dead, and above the firmament is first another ocean and then the interior of heaven. Through doors at the east and west points of the dome of the heavens the sun is admitted in the morning and makes his exit at night.

The Egyptian notion was quite similar. To those simple folk, the earth was like a long flat table, carrying at its corners four pillars to support a huge firmament of metal, beyond which were the "waters above the heavens." In this dome, the stars were hung, great lights to illumine the earth, and through its windows water was occasionally let down as rain upon the land.

With our present knowledge of the heavens, as revealed through the big telescopes, we smile at these primitive beliefs, and yet, in the face of the undoubted facts of scientific investigation to the contrary, many of us still cling to ideas of creation drawn from the same sources and equally primitive. With all our boasted learning, our thinking is often quite as crude as that of these ancient peoples.

Gradually during the first centuries of the church, there evolved an orthodox theory of the

universe. It was the product of many minds and grew out of various passages of Scripture. It never occurred to these people that the Bible is only a spiritual guide and not a text-book of science. Its poetic and figurative language was interpreted as literal truth. With all the facts of nature and the universe clearly revealed in Holy Writ, the pursuit of science was worse than useless. This prying into the secrets of God was blasphemous and iniquitous. It was much easier and far safer to construct a theory of the universe based on Scripture and imagination.

Some of the Scriptural references, such as the "doors of heaven," the "pillars of heaven," the "windows of heaven," the "waters above the firmament," the "corners of the earth," the "foundations of the earth upon the waters," and the "fountains of the great deep," clearly betray their legendary origin. From the beautiful imagery of Isaiah: "It is He that sitteth upon the circle of the earth, . . . that stretcheth out the heavens as a curtain, and spreadeth them out as a tent to dwell in," came the idea of the early Church Fathers that the universe is like a house. The firmament is the ceiling and the earth the floor. A huge cistern contains the "waters above the firmament," from which the Almighty and his angels let the water down upon the earth through the "windows of heaven." In the morning they hang out the sun to rule the day, and at eventide they pull him behind a mountain or push him into a pit, while at the same time they hang out the stars and moon to rule the night. Beneath the

floor of the earth and beyond the "great waters" surrounding the earth was hell. To the question, "Why is the sun so red in the evening?" it was answered, "Because he looketh down upon hell."

To the great mass of the faithful, rooted and grounded in ignorance as they were, these ideas seemed like a direct revelation from on High. And in that golden age of fancy, hundreds of myths having this imaginative background as their source circulated freely among the people. The catching up of mortals into heaven and the descent and ascent of angels were common occurrences. "Signs and wonders" hung from the heavens, the hurling of thunderbolts, the blowing of mighty winds, the sending of fiery comets, and miraculous interventions of every sort grew into fixed articles of faith in that fertile soil of superstition. And for this conception of things theologians fought long and desperately.

But the germ of truth was abroad in the world, and ultimately this elaborate work of the imagination was bound to go. Seventeen centuries before the time of Copernicus, Aristarchus, the most notable astronomer of antiquity, had proposed a theory of our solar system differing but little from that of to-day. This imaginative Greek, and Pythagoras before him, had taught that the earth is round long before the time of Christ. And the idea still lived. But the early Church Fathers opposed it strenuously. Even Luther, Melancthon, Calvin and Zwingli, the foremost leaders of the Reformation, regarded the belief as heretical. They were fettered to the legendary idea of a solid firmament



separating the heavens from the earth. To them it seemed for long an essential item of Christian faith, just as to-day a belief in the letter-proof accuracy of the Story of Creation is held by some to be all important to the salvation of men. And yet here and there some enlightened Christian thinker gave his assent to the idea of the earth's sphericity. The Scriptural utterances seeming to prove the flatness of the earth were disregarded. St. Augustine did not oppose the new view. Long before the Reformation, such authorities as Bede, Albert the Great, St. Thomas Aquinas and Dante had accepted it. But even after the idea had evolved into something approaching the nature of a tolerated belief, the Almighty and a host of angels were regarded as the direct operators of earthly affairs, both physical and spiritual. Huge monsters blew the "four winds" of heaven constantly toward Jerusalem, and God held the earth suspended by a rope. Angels laboriously turned the earth on its axis by means of cranks placed at the poles. Guardian angels constantly supervised in a very intimate way the personal actions of men.

Although the belief that the earth is round gradually grew in strength, another problem of staggering proportions presented itself. If the earth is a sphere, how is it possible for men to live on its under side? One eminent churchman asked: "Is there any one so senseless as to believe that there are men whose footsteps are higher than their heads? . . . that the crops and trees grow downward? . . . that the rains and snow and hail fall

upward toward the earth? . . . I am at a loss what to say of those who, when they have once erred, steadily persevere in their folly and defend one vain thing by another."

And this was a very real problem. The church took it up, and the whole matter quickly passed from scientific speculation to the realm of theological dogma. A host of Scriptural passages were marshaled in opposition. Salvation was held to be impossible to wilful believers in such a pernicious doctrine. St. Augustine thundered against it. The words of the Nineteenth Psalm: "Their line is gone out through all the earth, and their words to the end of the world," were regarded as absolutely destructive of this belief. It was urged that Christ could not have died for men on the opposite side of the earth and that at His second coming it would be impossible for them to see Him descending through the air. All this and much more contributed to the mighty tempest created by those misguided leaders who chose to believe in the literal truth of every Biblical text. And yet their mistaken beliefs were no more absurd, nor nearly as much so, as are those of many in this enlightened age who still persist in regarding the poetry and legend of the Old Testament as revealed truth in its most literal sense.

But years passed by, and centuries came and went. Then occurred two events which forever silenced all opposition. Columbus discovered America by sailing westward on the "great waters," and Magellan circumnavigated the globe. Men living at the antipodes had actually been seen. In the fol-

lowing years returning explorers and missionaries brought back confirmation in abundance.

The storm had passed. So far as the earth was concerned, the primitive notions of its geography had gone. Our world had increased enormously in size, and men's souls had expanded in equal measure. The conception of God had become a nobler one, and men's minds had taken the first step in that process of intellectual expansion which was one day to encompass a universe of infinite proportions. In one respect, too, the literal interpretations of Biblical texts had received a severe shock. The tempest had raged for twelve centuries, but by the middle of the sixteenth the skies had cleared and the world was ready to face the next great struggle between dogmatic belief in the imaginative creations of a legendary past and the revelations of advancing knowledge.

Before we pass on to this conflict, however, we must note a theological reconstruction of the universe which had been in progress for many centuries. It represented a unique blending of the ancient Ptolemaic theory of the solar system and the medieval interpretation of Scripture, together with the survival of certain Chaldean legends. In this universe building, too, the imaginative element did not cease to have full play. Instead of the flat plain and the solidly vaulted dome, the earth became an immense sphere located at the center of all the other heavenly bodies. Then, these gifted architects surrounded the earth with ten transparent spheres, all but the last rotated by angels and the

first eight carrying the planets and fixed stars. The tenth sphere, known as the empyrean, was immovable and marked the boundary between creation and the great outer void of infinite space. There sat God, enthroned in a wondrous light, which no one could enter, perpetually listening to the "music of the spheres," as they forever turned in rhythmic motion about the earth, the center of all creation. A vast heavenly host, consisting of hierarchies of angels of many degrees and orders constantly waited upon the Almighty and acted as intermediaries between Him and the earth. Within the earth was hell, the abode of Lucifer and the rebellious angels who with him had been driven from Heaven. These wicked angels were thought to be responsible for a deal of woe among the good angels and in the affairs of men. They caused storms and drought and ensnared men into ways of sin. Dante has immortalized this majestic conception for all time. Buttressed by many Scriptural texts and much theological reasoning, it prevailed for centuries. To cast doubt upon it was blasphemy.

#### THE EARTH DETHRONED

One evening, about the year 1610, at Padua, Italy, Galileo, even then world-renowned scientist and foremost apostle of truth, swept the heavens with his newly-invented "Optic Tube," and, behold, the celestial spheres vanished as by the waving of a magic wand. The time-honored system of Ptolemy was in potential ruins. With this first sweep of his



telescope, Galileo expanded the tiny world of the ancients to a universe of vast extent. Worlds without end sprang into view. Even with this simple instrument, he was amazed to discover that he could count ten times as many stars as were visible to the unaided eye. At a glance, he perceived that they are not all equidistant from the earth. Repeated observations from night to night disclosed phases of Venus, exactly similar to those of our moon. Thus was the belief of Copernicus that the planets are dark bodies shining by reflected light verified. The surface of the moon, shown to be scarred by rugged mountain ranges and pitted with volcanic craters, dissipated the Aristotelian idea that our satellite and the planets are perfectly smooth spherical bodies. Then, one evening Galileo turned his telescope upon the planet Jupiter, and a miniature solar system sprang into view. He watched these tiny "stars" from night to night, and quickly established their revolution about the parent planet. Indeed, here seemed a foreshadowing of the truth of the Copernican theory that the planets, of which the earth is one, revolve in immense orbits about the central sun. Pointing his magic instrument at the sun, he quickly discovered dark spots, seeming blemishes, upon the bright surface of the ruler of the daytime skies. Thus, sunspots, those gigantic whirlpools of solar activity about which we still have much to learn, became a fact of astronomical discovery. Their movement under continued observation proved the rotation of the sun itself. Under the uncanny vision of this simple prophet of the

Italian hills, the beautiful Milky Way was resolved into myriads of faint stars at such immeasurable distances as to be utterly invisible to the naked eye. Great discoveries were these, more significant than the world had ever witnessed before. Under their influence men grew in mental stature. They represented the first great step in the emancipation of mankind from intellectual bondage to the powers of ignorance and superstition.

But what a wreck these discoveries made of the sacred system of the universe! Continued observations from week to week and month to month proved that the planets do revolve about the sun, and not the sun, stars and other planets about the earth. Truly, the earth had been dethroned. It shrank to a relatively insubordinate place in the solar system and to insignificance in the vastness of the stellar world. The Copernican view of the heavens, which the great Polish astronomer had not dared to publish for thirty years under fear of the Inquisition, was vindicated for all with eyes to see and faith to believe in these epoch-making revelations of science.

As was to be expected, a theological storm of vast magnitude swept the earth. Intrenched ignorance was not easily to be routed from its stronghold. Reverence for the sacred past was stronger than the desire to know the truth. All the forces of the church, both Catholic and Protestant, were arrayed against Galileo. Martin Luther nearly a century before had opposed the sacrilegious belief. Among other intemperate utterances, he said: "People gave ear to an upstart astrologer who strove to

show that the earth revolves, not the heavens or the firmament, the sun and the moon. Whoever wishes to appear clever must devise some new system, which of all systems is of course the very best. This fool wishes to reverse the entire science of astronomy; but sacred Scripture tells us that Joshua commanded the sun to stand still, and not the earth." Melanchthon, associate of Luther in the Reformation, declared: "The eyes are witnesses that the heavens revolve in the space of twenty-four hours. But certain men, either from the love of novelty, or to make a display of ingenuity, have concluded that the earth moves; and they maintain that neither the eighth sphere nor the sun revolves. . . . Now, it is a want of honesty and decency to assert such notions publicly, and the example is pernicious. It is the part of a good mind to accept the truth as revealed by God and to acquiesce in it." Calvin, with the apparent finality of divine warrant, asked: "Who will venture to place the authority of Copernicus above that of the Holy Spirit?"

These outgivings of great men, blinded by religious zeal, sound strangely similar to the utterances of misguided modern prophets. The "heresy" of evolution to-day stands on precisely the same footing as the three-centuries old "irreligious" belief in the new heavens. The one is as certain of victory as was the other, for no human agency can long withstand the irresistible forward sweep of God's eternal truth. "Sound learning" and "safe science" can ultimately find no stamping-ground in clarified modern thinking.

The discoveries of the great Florentine philosopher were held to contradict such Biblical passages as the sun "runneth about from one end of the heavens to the other"; "the foundations of the earth are fixed so firm that they can not be moved"; and the reference to the moon as "a great light." One said, "His discovery vitiates the whole Christian plan of salvation"; another, "It casts suspicion on the doctrine of the incarnation"; while others were alarmed because "It upsets the whole basis of theology. If the earth is a planet, and only one among several planets, it can not be that any such great things have been done specially for it as the Christian doctrine teaches. If there are other planets, since God makes nothing in vain, they must be inhabited; but how can their inhabitants be descended from Adam? How can they trace back their origin to Noah's ark? How can they have been redeemed by the Savior?" Absurd as these questions seem to us, they were very real then, just as the problems of evolution are to many honest souls to-day. But there is no shadow of doubt that, in the quite near future, both will be regarded in the same light.

In vain did the spokesman of the Jesuits thunder that "The opinion of the earth's motion is of all heresies the most abominable, the most pernicious, the most scandalous; the immovability of the earth is thrice sacred; argument against the immortality of the soul, the existence of God, and the incarnation, should be tolerated sooner than an argument to prove that the earth moves." How firmly myth and legend fettered the thinking of the time, the fol-



lowing statements from one of Galileo's Catholic critics well illustrates: "Animals, which move, have limbs and muscles; the earth has no limbs or muscles, therefore it does not move. It is angels who make Saturn, Jupiter, the sun, etc., turn round. If the earth revolves, it must also have an angel in the center to set it in motion; but only devils live there; it would therefore be a devil who would impart motion to the earth."

How the aged Galileo, twice summoned before the Inquisition, was forced on bended knees under threat of personal torture to recant his belief in the movement of the earth, the world well knows. But no earthly tribunal could stay the triumph of his ideas. The truth was abroad. The tiny world of the ancients and the early church could no longer contain the thoughts of men. Galileo's telescope had shattered it past the possibility of reconstruction. True, for a century after his death in 1642, Protestant theologians and benighted Catholic prelates sought to prove that the Copernican theory could not be reconciled with Scripture. But it was all utterly futile. The church was compelled to retreat; the mythical firmament of the ancients disappeared forever before the telescopic revelations of this simple astronomer of Pisa, Padua and Florence.

And what had been gained? The triumph of truth, deeper knowledge, keener insight, broader vistas for the soul, a universe of infinite spaces, a starry heaven of immeasurably greater majesty and beauty, tremendous growth in mental stature, a larger and nobler conception of God.

## THE EMERGENCE OF LAW

But, though the new heavens had been established, there was as yet no reign of law. Here were majestic movements of the planets and their satellites, of the utmost precision and of immense significance, but no coherent system binding together the members of the solar family had been discovered. And then, as though directed by the hand of an unseen guide, Johann Kepler crystallized for all time this new knowledge by his discovery of the laws governing the planetary movements. His three laws, binding the solar system into a unit and eliminating the element of caprice, placed the new fortress of astronomical science upon a secure foundation. To no purpose was he warned by the church "not to throw Christ's kingdom into confusion with his silly fancies," and ordered to "bring his theory of the world into harmony with Scripture." But the edifice, reared by Copernicus and Galileo and stabilized by Kepler, could not be thus easily overthrown. At last men's eyes had been opened to the truth. Freed from the notion of angelic direction in the movements of the heavenly bodies, the idea of a reign of law began to take shape in the minds of men. Still, the capstone to the structure was lacking. Something more was needed to give perfect harmony to this little group of cosmic units navigating the immeasurable spaces of the stellar sea. And, as all the world knows, this something was soon supplied by Sir Isaac Newton in that incomparable expression of the Divine Immanence, the Universal Law of Gravitation.

How Newton brought under the sway of this law not only the paths of moving bodies at the surface of the earth, but also the motions of the moon, the planets and their satellites, the comets and meteors, and even the rising and falling of the tides, constitutes one of the most significant chapters in the story of scientific achievement. Unless we except Einstein's discovery of relativity, it is beyond question the most masterly mathematical feat ever accomplished by the mind of man. When Newton had shown that Kepler's laws of planetary motion could have been predicted as necessary corollaries of his all-embracing law, the fundamental significance of this revolutionizing discovery became apparent to all who had ears to hear and the will to understand.

Still, the church did not welcome this emergence of law. This substitution of understandable law for divine intervention was held to detract from God's power and to be derogatory of His Majesty. To these small-visioned leaders the discovery of natural laws was looked upon as a serious curtailing of God's prerogatives. They could not see that back of them must be a Divine Lawgiver and that they lift to a loftier plane the majestic conception of His supremacy. And so Newton, like many other apostles of the truth before and since, was regarded as an enemy of God. He who had unlocked the very ante-room to the eternal mysteries of the universe was pilloried as an atheist.

But the old heavens had gone. "The spacious firmament on high," "the crystalline spheres,"

“the windows of heaven,” “the waters above the firmament,” “signs and wonders,” the hierarchies of angels attendant upon the earth and the heavens,—all this and much more had vanished. Instead men saw the perfect reign of all-pervading law. When toward the middle of the last century, Neptune, the outermost member of our solar system, was added to the sisterhood of planets solely through the aid of Newton’s Law of Gravitation, the sovereign sway of this divine expression of God’s method of ordering the movements of the heavenly bodies became acknowledged of all men.

And thus through the conquests of these great pioneers of scientific discovery, the religious ideals of men and their conception of God had been given truer and nobler meanings. Indeed, these paths of science had led to a deeper and more reverent knowledge of Him whose life is the soul of the universe. In place of a sort of indefinitely magnified and glorified watchmaker, a mighty genius in cosmic mechanics, who had manufactured a world and set it going, subject to miraculous intervention by himself and a host of celestial assistants, men began to catch a vision of the all-sustaining immanence of a Divine Guide,—always at work, always creating, always directing the destinies of men and events. Everywhere is ceaseless change. Nowhere is there perfect adjustment and harmony, always a constant becoming, a never-ceasing growth. The world is never finished, never a flawless work of art, but always striving toward perfection, taking its course, it may be, toward that “one far-off divine event toward which the whole creation moves.”



And what a mighty universe had been unveiled! What stupendous spaces for the flights of fancy and the thoughts of men! Star clusters so far away that light traveling at the slow speed of one hundred and eighty-six thousand miles a second, requires two hundred and twenty thousand years to reach this planet. And how insignificant this little earth became, but the merest speck of matter spinning in infinite space! Yes, men's minds broadened immeasurably, not all at once, but in the course of years, as they contemplated the ever-increasing vastness of this new universe of time and space.

Surely the world had traveled a long way from the age of myth and legend to the reign of celestial law.

## CHAPTER III

### THE MEANING OF EVOLUTION

“THE prophet of the newer religious thinking now looks out upon a universe that is marching upward, under the guidance of an Unseen Leader whose signals from the heavenly battlements are to guide the pilgrim hosts. Slowly the fire mist cools, puts on a decent crust, and becomes the home of cities and civilizations. Slowly the soil climbs toward grass and shrub and flower. Slowly the little rose, always single and pink, drops its petals to enrich the soil, that to-morrow’s rose may be double and crimson with every hue and perfume. Slowly the thorn apple becomes the Winesap and the Golden Pippin. Slowly the wild rice becomes the Fife wheat; the Indian corn that had six husks around every grain climbs toward the ear that has husks only on the outside of all the grains. Slowly the hut becomes the home; the forked stick a steam plow; the hollow log, the *Mauretania*; the rude hieroglyphs upon the tree, telling which way the hunter went, become letters and literature. Slowly the ochre on the cheek of the savage becomes the canvas on the wall; and the stone altar becomes the cathedral, while the medicine man, pounding on the drum, becomes the pipe organ; the bleeding human

sacrifice becomes the sacrifice of a broken and a contrite heart, an acceptable gift offered to an unseen Friend and Ruler. And this creative act of development is manifestly going on every moment, for all who have eyes to see the invisible signs, or ears to hear the sweetest overtures that ever fell from the battlements of Heaven. Through ever enlarging cycles and higher levels, this creative work that began as the blade and journeyed on toward the stalk will increase until it becomes the full Harvest of God." Thus, does Doctor Newell Dwight Hillis writing in *The Forum*, for July, 1923, interpret the religious meaning of evolution.

And so we may gather that evolution is the eternal law of growth. It had its beginning with God, and slowly, majestically, it takes its course across the countless ages, which we call Time, toward that "one far-off divine event to which the whole creation moves." It was at work in the nebula which gave birth to our solar system. It makes this world of ours kin to the dog star and the fire mist of the Milky Way. It links us to the vast "heavenly host" which peoples the infinite depths of space. Even when the "earth was without form, and void," this law of growth found expression in the marvelous systems of atoms, molecules and electrons,—the building blocks, so to speak, of the Great Architect. The elemental forces of heat and wind and rain and moving water which shaped our planet for the abiding-place of living things worked in perfect harmony with this symphony of eternity. And, when in the Infinite Scheme of things the first

simple forms of life appeared, they began to evolve to the music of this marching song of the ages. When so recently that it seems but yesterday, in comparison with the myriads of centuries which had preceded, man appeared upon this earth, it was in accordance with the fundamental Purpose which governs the destinies of all creation.

But what does evolution mean to the average individual? What is this strange doctrine which to many seems to have fallen like a bomb into a peaceful camp, upsetting our orthodox notions of the eternal verities of things and spreading dismay among the worshipers of a sacred past? What is this religious furor, of which we hear so much, all about? What is the gist of this battle between the Fundamentalists and the Modernists,—a battle which sounds like religious thunderings of the Middle Ages? Why do the legislators of certain states seek to prohibit the teaching of evolution in the public schools? Does this new knowledge destroy the faith of our fathers? Does it imperil the progress of the spiritual forces of civilization? Does it blaze new trails where angels fear to tread? Does it destroy belief in God? Has it brought us face to face with the time when, as Comte said, “we may escort the Creator to the edges of the universe and bow Him out with thanks for His past services”? Is this theory of evolution merely a pretty guess, a fine-spun fiction of the imagination, or does it rest upon a solid basis of evidence and facts? Is this a colossal piece of error and falsehood that men assail or a majestic truth of God’s eternal years? These are



some of the questions which are troubling honest souls, and they deserve answers which shall leave no room for doubt.

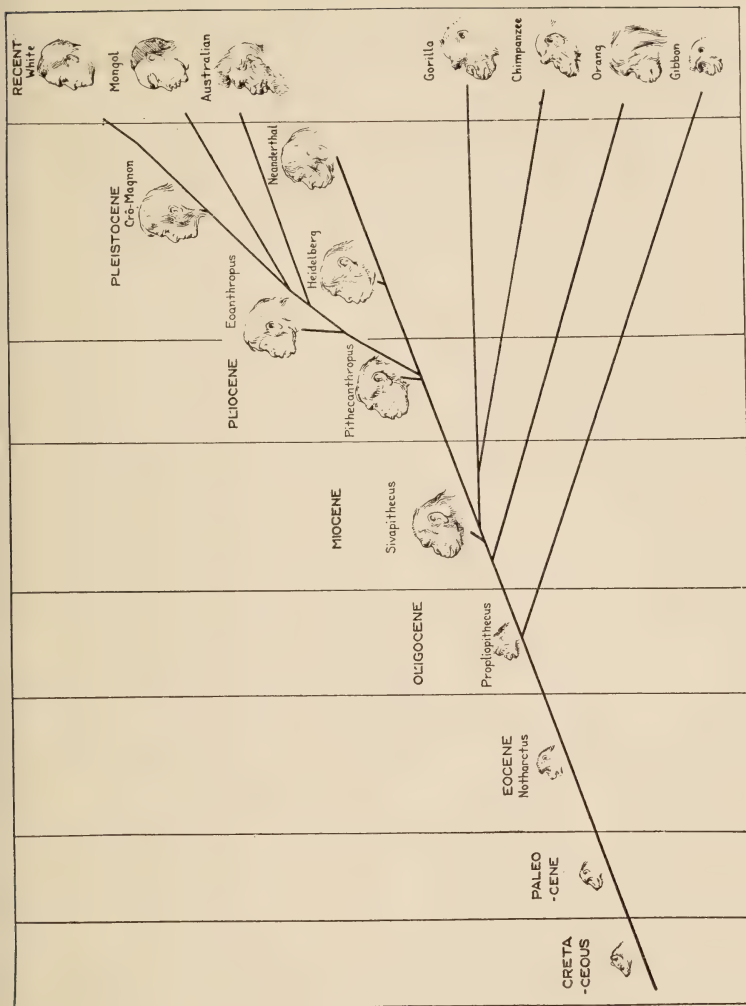
But before we can discover these answers, we must drag forth this monster of evolution from his lair and turn upon him the full searchlight of truth. No belief, either religious or scientific, has anything to fear from the truth. Sometimes I am reminded of the old gentleman who, when told that the facts did not support his contention that the earth is flat, retorted, "So much the worse for the facts."

The other day a friend said to me in conversation, "You don't believe, do you, that stuff about man's coming from a monkey or an ape?" And this question illustrates precisely the idea which hundreds of people have of evolution. It measures the sum total of their false "learning" concerning this epoch-making theory. How far this notion is from the real teachings of scientists has been well put in the following words of Doctor Hillis taken from *The Forum*, for July, 1923: "It is, however, not accurate in terms of science to say that man came upward from the ape and the monkey,—indeed it is quite untrue to science to hint at such an affirmation. What science does say is that ages ago the life path parted at a point where the ancestors of man started toward a thin skull and a large brain, while the other physical line started toward an ever-thickening skull with a stationary brain and after untold ages has developed into the ape. Millions of years after these two lines parted company, one being became man, standing forth under the

stars and with adoring thoughts answering certain signals from the sky. The answer is not which origin would we prefer, but which origin represents fact in history."

The question of my friend is simply the centuries-old question which has been asked about every great discovery of science. Men do not like to be jostled from their comfortable niches of mental security. For ages the heart pumped the blood through the body, but no Harvey perceived it. Gravitation had held sway from nebula to planet, but no Newton explained its law of action. From the beginning of our solar system the earth has been whirling about the sun, but not until "yesterday" did Copernicus and Galileo indicate the path of its motion. For millenniums the lightning flash and the crash of thunder startled men, but no Franklin sought to discover their causes. From the foundations of the earth, the fossil record of the rocks has been as an open book, but no eye, until recent times, was able to read their dialect. The evidences of evolution, too, lay about men in bewildering profusion, but no Lamarck or Darwin appeared to unravel their meaning.

But now let us make an earnest effort to discover what evolution is and what it is not. Let us try to understand the evidences upon which this theory rests. Like a jury, we shall sit in judgment upon this new view of the development of life. If the evidence seems to be insufficient, we shall not hesitate to condemn it. But if the facts of observation and experiment lead us step by step to



*Courtesy The American Museum of Natural History.  
Prepared by Professor Henry F. Osborn and Dr. William K. Gregory.*

### MAN'S FAMILY TREE

Branching from one trunk of the class of mammals, but on lower lines of ascent, are the anthropoid apes. The earliest known fossil of the human family is the Java Man (Pithecanthropus). On the "line royal" are the Pittdown Man (Eoanthropus) and Cr-Magnon Man. The latter belonged to the same species as modern men. (See page 126 and following).





the irresistible conclusion that evolution is God's way of working out the divine pattern of the universe, our verdict must proclaim the truth. As Doctor Charles E. Jefferson said to me in a recent letter, "If newly discovered truth conflicts with the Bible, or with the Creed, then the interpretation of the Bible and the Creed must be widened to make room for the new facts."

#### WHAT EVOLUTION MEANS

Evolution is the scientist's answer to the eternal question "How?" How did this earth and the solar system of which it is a part come about? What was their origin? In what form did this planet take its beginning? When and how have the manifold forms of life of past and present geologic time appeared? Is creation a process or a product? Does it represent a single grand fiat at a comparatively recent moment of cosmic time, or is it the gradual unfolding throughout the ages of a divine pattern in which the Creator has spun the threads of destiny and woven them into the fabric of fire mist, sun and planet,—of earth and water and life? Is creation still going on, here and now? Is God still at work in His universe? Or, is the product of His handiwork a static thing, a stranger to change and growth? Does the legendary story of creation, written in the childhood of the race, tell us the whole truth about the origin of our world? Must we shut our eyes to the facts of scientific investigation? Are we not permitted to believe that God is still revealing Himself in every new dis-

covery of science? And may not this progressive revelation be the fundamental fact of evolution? Does God no longer raise up prophets to proclaim His truth? May not the distinguished scientist, Doctor J. S. Haldane, be right when he says "the life of such a man as Charles Darwin is in truth a standing proof of the existence of God"?

Let us get rid at the very outset of the false idea that evolution eliminates God. That "The heavens declare the glory of God; and the firmament sheweth His handiwork" is as true to-day as when uttered by the Hebrew Psalmist three thousand years ago. In the words of the late Lyman Abbott, appearing in *The Outlook* for February 15, 1922, "that evolution removes God from the universe is not true; on the contrary, it shows Him now and always in the universe; it gives a new significance to Christ's saying, 'My Father worketh even until now'; it justifies the sacred poet's declaration, 'God is never so far as even to be near'; it shows us nature and history full of the presence of God." As we shall see, evolution without God is an impossible conception.

And as to the relation of evolution to life, let us quote from an article in *The World's Work*, for May, 1924, by Professor Vernon Kellogg, one of the foremost scientists of this country. He says, "Evolution means continuity, means transmutation, the origin of the new from the old; means change, continuous movement, gradatory development. It means genetic (historical) relationship, blood cousinship, an all-embracing genealogy of life. Every

living creature, be it monstrous whale or microscopic phosphorescent animalcule in the ocean, free-roaming tiger in the jungle or minute parasite that crawls about over its skin, wheeling eagle surveying its broad domain of air and land over a life span of many years, or swarm of fluttering May-flies dancing an evening's life away about an electric light by the lake shore, giant sequoia holding its proud place in a Sierran forest through thirty centuries, or tenderest bit of transitory moss that nestles at its base—every living creature, large or small, long-lived or ephemeral, active or quiescent, myriad-celled or single-celled, is, in certain fundamental structure and behavior, like every other living creature. It has need, to remain alive, of certain physical and chemical surroundings which every other living creature has to have, and it does certain things which every other creature does.”

And so we may say that evolution in its broad aspects stands for progress, for divine revelation; that it is the method of creation, the eternal expression of the life of God in all created things. It means the kinship of all life. It shows us, as we shall see, that plant and animal life, beginning with the simplest forms, ages and ages ago, so long that it bewilders thought and staggers the imagination to attempt to think of so remote a past, has slowly and without haste evolved into constantly higher forms, until at last the animal line of ascent culminated in man, of whom we may exclaim with Shakespeare,

What a piece of work is a man! How noble in reason! how infinite in faculty! in form and

moving, how express and admirable! in action how like an angel! in apprehension, how like a god! the beauty of the world—the paragon of animals!

And if this lowly origin should seem to any of us repugnant to our pride,—a pride arising from many centuries of self-worship,—let us remember that it does not rob man of his sense of uniqueness. He is the only animal into whom God has breathed the faculty of reason. He is still the lord of all creation. And his ancestry is a noble one, for it is in accord with the divine plan of the universe, and to be divine is to be noble.

There is, indeed, something truly noble in this emergence of man from the brute and savage. Driven by the heat of summer, the cold of winter, changing climate, famine and pestilence, peril and hardship, man was forced to struggle and at last to think. Then one day the dreamer appeared in his midst, and with him began the dawn of civilization, for it is to the dreamers that the race owes its homes and inventions and arts and laws and liberties and religions.

And who can doubt that in it all, from the lowest organism to the soul of the dreamer, we see the life of God as the immanent source and guide of all creation?

#### THE HISTORY OF EVOLUTION

The idea of evolution is older than the Christian religion. It had its origin way back in Greek philosophy. This thought of the continuous development of the universe from the simple to the



complex had a wonderful charm for that brilliant race of speculative thinkers. Still, with those early Greeks the theory was only a guess. It was like the happy guess of Democritus concerning the existence of atoms,—a guess which turned out to be surprisingly similar to the experimental theory set forth by John Dalton twenty centuries later. But unfortunately the Greeks placed little value upon observation and experiment. As a result, they accumulated no evidence to support their idea, and no champion appeared in defense of it for many centuries.

But sooner or later every great idea, if it be true to nature, must find expression. And so it was with evolution. All through the Middle Ages this speculative theory of the Greeks was allowed to slumber, just as for so many centuries their notion that the sun is the center of our solar system, and not the earth, was suppressed. But to many careful observers the fact of evolution constantly became more and more apparent. Leonardo da Vinci, that many-sided genius of the Italian Renaissance had notions of evolution. Finally, during the last decade of the eighteenth century, three distinguished men, independently of one another and practically at the same time, proposed the first explanation of evolution. These men were Goethe of Germany, St. Hilaire of France, and Erasmus Darwin (grandfather of Charles Darwin) of England.

These pioneers in a new domain of scientific investigation, however, soon found themselves only

groping somewhat blindly in search of the truth. Their belief that animals are plastic to their environments, as clay beneath the potter's fingers, proved to be a superficial and inadequate explanation of the undoubted fact of evolution.

Strange as it may seem, the first real evidence of evolution was provided by an English surveyor, William Smith, whose keen observation was challenged by the fossil shells preserved in the rocks and soils over which he worked. Fossils had been noted many times before, but they had only excited curiosity. Some had thought them the imperfect specimens of God's handiwork in His early attempts at creation. Others had believed that the Creator placed these fossils in the rocks for the express purpose of mystifying men. But not so, this shrewd surveyor. He saw that the fossils were of different kinds, and that they were arranged in regular systems. He began to explore the country for vertical sections of rocks, and wherever he found them, the fossils were always in the same order. He became fascinated with the investigation. He was quick to see that many of these forms were quite different from any then living. There was but one conclusion. They were the fossil remains of extinct animals which had lived in some previous geologic time. As he passed from the older to the newer rocks, the animal life became of a constantly higher and more recent type. Gradually, certain forms of life disappeared and never reappeared in any later rock layers. It was not long until Smith was able to designate the

relative age of a rock and the order of its occurrence from the character of its fossil population. Irresistibly the conviction forced itself upon his mind that the earth in past geologic time had been successively inhabited by species of animals which had each in its turn become extinct. An epoch-making idea was this, and one which was destined to bear fruit an hundred-fold.

And it soon became apparent that intermingled with these evidences of extinct animals were the fossil forms of plants, many of them, too, belonging to species not then living upon the earth. Here were surely the imperishable volumes of Nature's library. True, the record is fragmentary; its chapters are scattered; and there are many broken lines and missing pages. But it is a marvelous tale that this record has preserved throughout the ages, and its language is so plain that all may understand. These are the real tablets of stone on which the Creator has engraved the progressive record of His handiwork. These fossils are not fictions of the imagination, but enduring evidences which any one may verify anywhere. No one familiar with this overwhelming mass of evidence can longer believe that in the beginning God created the vast numbers of animals and plant forms in fixed species, exactly as they exist to-day. As we shall see, this belief has now been made utterly impossible.

But you ask, "How were these fossils, which give us so vivid a picture of the life in those far-off ages, formed?" Let us see. While the sediments which

formed the rocks in which the fossils occur were still soft, they received the impress of creeping things. They were marked by the waves of the sea and pitted by the raindrops of passing showers. Such sediments were constantly forming about the margins of both salt and fresh water, just as they are to-day. In them innumerable shells and the skeletons of all sorts of animals became embedded, even as the life of the present age is writing upon the plastic tablets of lake and sea bottom its imperishable record for the countless centuries yet to come. Succeeding layers of sediment covered these dead remains, sometimes to great depths, each layer in turn becoming the fossil burying-ground of whatever types of life happened to live and die at the time of its formation. During the inconceivably long periods of time which followed, the shifting contours of continents, the gradual elevation of sea bottoms, and the filling of lakes slowly added these deposits, now hardened into rock, to the mainland. To-day, we uncover these indelible impressions of early geologic life with our plowshares, we find them on the canyon's side, we blast them from the quarries, and we dig them from the mines. In them we read the life story of our planet. And the successive rock layers unfold for us, too, the leaves of nature's ancient herbarium. They caught the dying leaf and twig and branch of early geologic forests and preserved for future ages the delicate tracery of their myriad forms. Closing about the tree-trunk, these soft sediments changed it into stone. Not long ago, in the library of the Wyoming



Geological and Historical Society, at Wilkes-Barre, Pennsylvania, I saw the fossilized form of a huge tree-stump, taken from a coal mine three hundred feet below the surface. In some far-distant time, millions and millions of years ago, we may be perfectly sure that this stump supported a majestic tree, possibly a monarch, among its associates, towering giant-like into the air and sunshine of some Carboniferous forest. And we know that the long slabs of bark on exhibition, totally different from any forms now living, once covered real trees, throbbing with life and probably clothed in beauty.

One of the most notable examples of plant fossils is to be found in the coal beds. That coal is of vegetable origin, "the litter of primeval swamps and forests," now buried hundreds of feet beneath the surface of the earth, there is not a shadow of doubt. Slowly, through vast periods of time, this crystallized sunshine was accumulated for the world's present need. But immense as these periods seem to us, they are but fleeting moments in the evolution which fitted our planet for the abode of man. These fossil records, found in such bewildering abundance, enable us to picture in imagination the warm humid climate and the luxuriant vegetation of those coal forests which ante-dated so many millenniums the appearance of man upon earth.

Here, indeed, are chapters from the early history of the earth and its life which exist in their own right, independently of any myth or legend. And, through the interpretation of the scientist, they

reveal a record of undoubted truth. We shall refer to this fossil record again in stating the chain of evidence in support of evolution.

After William Smith came Baron de Cuvier, the leading French scientist of his time and the founder of comparative anatomy, to forge the next link in the preliminary chain of evidence. One day while working in a quarry, workmen unearthed some strange-looking bones. They carried them to Cuvier, and his examination quickly told him that these bones belonged to a species of animal which he had never seen before. With this discovery as a starting-point, Cuvier had within a few years accumulated bones from about twenty-five species of animals that he believed were no longer living upon the earth. A little later in a published volume on fossils, he described for the first time the mammoth, an extinct type of elephant, which many centuries before had roamed throughout Europe and as far north as Siberia. It was clear to Cuvier that many species of animals had lived upon the earth in past geologic time which have since become extinct, and he announced this view in his writings and public lectures.

But inexplicable as it seems to us to-day, the great Cuvier did not correctly explain the appearance and extinction of these successive species of animal life. A simple but superficial answer at once presented itself. Special acts of creation produced the first species. Then at intervals in world history, great natural catastrophes had occurred, completely engulfing the earth and destroy-

ing all life upon it, each in turn followed by renewed acts of special creation to provide new species. Even this moderate explanation proved startling to those orthodox individuals and theologians who wished to believe, regardless of the evidence, that rocks, fossils, animals and plants had been created in the beginning by one grand fiat, just as they exist to-day. But with these historic discoveries and the discussion which they provoked, the outworks of the citadel of special creation fell. No longer could there be any doubt that some sort of evolution had taken place upon this planet.

Then came Sir Charles Lyell, the greatest geologist of his time, to show that the history of our planet, as revealed in its rocks and fossils, gave no evidence of world-wide catastrophic changes. This temporary refuge of those who blindly fought the progress of scientific investigation seemed about to be swept away. For the first time, a truly great scientist announced his belief that the same slowly acting forces of nature, which we see in operation all about us to-day, have also wrought the changes of the globe in past geologic time. With irresistible logic, he pointed out that the age of the earth, from being but five or six thousand years, as required by the Story of Creation, must be millions and millions of years. To crown it all, he shattered the centuries-old myth that the fossils of the rocks were produced by the Deluge of Noah. The indignation of church leaders and orthodox believers knew no bounds. Lyell was attacked without mercy and for a time he was

socially ostracized. No attack of the present Fundamentalist movement against the teachings of evolution can compare with the bitter denunciation of Lyell. Yet to-day, the simple truths which he so ably set forth a century ago have become by common consent a part of the instruction of every school child of the country. Gradually, enlightened churchmen everywhere saw the untenability of their position and quietly withdrew. It was a repetition of the surrender of their predecessors to the Copernican theory of our solar system and a forecast of what will be the ultimate verdict concerning the truth of evolution.

Still, although the fact of evolution could no longer be doubted, no one had come forward with an adequate explanation of the process. And we may say in passing that, while no prominent scientist of the world to-day doubts the fact of evolution, still no entirely satisfactory explanation of all the facts of observation has been provided. This is true of any scientific hypothesis. We never reach ultimate truth. At that time, all of the leading scientists of Europe, including even Lyell, held to the theory of special creation, that is, successive acts of special creation. It may be pointed out that even this view, a view which was taken a century and more ago, discredits the literal truth of the Biblical account.

Even before this time, Jean Baptiste de Lamarck, a contemporary of Cuvier and one of the most brilliant scientists of any time, had put forth a theory of evolution, based upon facts of direct



observation, which in modified form has held followers even down to the present day. It is not too much to say that this French scientist, who did his most important work after he was fifty years of age, was the first great apostle of evolution. But unfortunately the opposition of Cuvier, the most influential zoologist of Europe at that time, doomed Lamarck's views to a tardy recognition, and he died without receiving the credit that was his due.

His wide observation and study of fossil forms led him irresistibly to the conclusion that the present types of animal life had been evolved from lower types in accordance with some definite law of Nature. The constantly increasing difficulty which he experienced in drawing sharp lines of distinction between existing species gradually convinced him that all animals have arisen through slow processes of change from some remote parentage. In imagination, Lamarck carried the animal life of the earth backward through vast periods of time to the simplest forms of ancestors. And in so doing he outlined for his own and later generations the essential idea of organic evolution.

To account for this ceaseless process of continuous change, Lamarck put forth his doctrine of the use and disuse of organs and the hereditary transmission of acquired traits, or characters. His idea was briefly this. When an organ is used to an unusual degree, it becomes highly developed, and similarly the disuse of an organ causes it to degenerate. He held that such organic changes are transmitted to the offspring and that the cumulative

effect of many generations of breeding may either radically change an organ or cause it to disappear entirely. Thus, he thought birds near the seashore developed their long legs from the necessity of wading deeper and deeper in water in search of food. The horse-like ancestors of the giraffe developed a long neck by being driven from grassy meadows into regions which compelled them to obtain their forage by browsing on the foliage of trees. The constant stretching upward after food would elongate the neck and the fore limbs. These newly acquired characteristics, he believed, would be transmitted to the offspring and after many generations a new species would be evolved. Many more examples might be given, but these are sufficient.

The theory looked plausible, and it found many adherents. But a century and more of observation and experiment since Lamarck's time seems to have demonstrated that the inheritance of acquired characters never takes place. Doctor Albert E. Wiggam in his splendid book, *The Fruit of the Family Tree*, has developed this point at considerable length. Lamarck's bold announcement of a definite theory of evolution at that early time stamps him as a man of genius, but his particular method of accounting for the facts of observation has fallen by the wayside. Scientists are always ready to throw aside a theory which does not square with the facts.

And right here let it be stated that while scientists differ widely as to the precise methods by which evolution has come about, they are practically

unanimous as to the fact of this progressive change from lower to higher forms of animal and plant life. It could not be otherwise, for the overwhelming abundance of evidence makes any other view impossible. And yet I wish to emphasize over and over throughout these pages the outstanding failure of many scientists to realize that evolution is nothing more than a description of God's way of working. It simply substitutes for the poetical Story of Creation, as outlined in Genesis, the undoubted facts of scientific investigation. But any attempt to account for the origin of the universe and the life of our planet without placing back of it the intelligent thought and purpose of an Infinite Creator is doomed to utter and complete failure. Even had the results of observation and experiment borne out Lamarck's theory of the progressive development of animal species, this discovery could have meant only that men had drawn aside the veil and caught a glimpse of the divine process of creation. The tragedy of much of the scientific and theological discussion in this field during the last half-century and more has been due to the misunderstanding of this simple fact. Science and religion each stands in its own right, and there never has needed to be any essential conflict between them.

Conditions did not seem right a century ago, even among scientists, for a favorable reception of Lamarck's theory of evolution. But in 1831, just two years after the death of the great Frenchman, there began a voyage of discovery, destined to have an in-

fluence upon the intellectual development of men, challenging in its far-reaching importance the influence of that other voyage of discovery made in 1492. In that year, the British ship *Beagle*, in command of Captain Fitz-Roy, began its historic voyage around the world, a voyage which lasted for five years. There would have been nothing sufficiently noteworthy about this expedition to mark it for everlasting remembrance throughout the centuries to come, had it not been for the presence on board of Charles Darwin as official naturalist. Darwin was then but twenty-two years old, having been born on February 12, 1809, the same day which marked the birth of the immortal Lincoln. The simultaneous birth of two such giant leaders of the race should forever consecrate that day as one of the most significant among the annals of men.

The purpose of the expedition of the *Beagle* was to make a survey of unexplored regions in the lower portions of South America and of certain islands in the Pacific. Darwin, the son of a distinguished family and an ardent naturalist from his boyhood up, eagerly welcomed this opportunity to study first-hand the rocks, and the animal and plant life, both past and present, of unknown lands. He little knew, as he sailed away, that he should return with a mass of evidence so complete and overwhelming in its significance as to change not only his own view of the development of life upon this planet but also the view of the large majority of thinking men. In a word, he was to forge a chain of evidence in support of evolution, so complete and



convincing that only he who wilfully refused to examine the facts could longer doubt the truth of this all-embracing law of organic development. And who shall say that in these epoch-making discoveries it is impossible to descry the guidance of an infinite and all-wise Purpose? Darwin started out a believer in special creation. He came back the world's foremost apostle of evolution, but not an atheist.

Almost overnight Darwin became a geologist, a botanist and a zoologist. Wherever the ship landed, the rocks and their fossils became the especial object of his study. His explorations were confined chiefly to long journeys in the interior of South America and to expeditions in the Galapagos archipelago, a group of volcanic islands some five hundred miles west of the coast of Ecuador. In these observations three sets of facts challenged his attention. (1) Buried in the surface deposits of the great grassy plains of Argentina, Darwin discovered the fossil remains of huge extinct animals covered with armor, like that of the existing armadillos. This discovery pointed irresistibly to the conclusion that the present species had been evolved in some manner from those which had become extinct. And it is perfectly legitimate to ask those who do not wish to believe in evolution how they would account for such variation and such resemblance. (2) And then again, as Darwin moved southward, he found that certain species of animals were replaced by others which closely resembled them, and yet were distinct. To his keen mind a very plausible ex-

planation presented itself. As the animals of a single species spread over large areas, particular groups would become isolated. Throughout long periods of time, these isolated groups, in response to their different environments, would become so modified as to give rise to several new species. Here evolution seemed to have taken place among species actually living upon the earth at that time. (3) But most convincing of all were the evidences obtained from the Galapagos Islands. Here was a group of islands far from the mainland, rich in animal and plant life, which decidedly resembled that of the American Continent, and yet consisted of distinct species. Furthermore, each island of the group possessed a considerable number of species peculiar to itself, that is, related to but differing from those found on the other islands. Now what explanation was Darwin to give? What explanation would you give such facts of observation? Would you turn to the legends of Genesis and chloroform your intellect, or would you exercise your God-given right to think and attempt to construct an hypothesis which should account for things as they are? As it seemed to Darwin and as it has seemed to all thinking men since, just two explanations offered themselves. One might stifle his reason and blindly profess to believe that in the beginning God created for these islands this peculiar animal and plant life closely resembling the life on the American mainland and yet distinct from it and also distinct from any other species the world over. Or, one might accept the almost inevitable conclusion

that the first forms of life were brought to these islands from the mainland many centuries ago by wind and wave and winged carrier and that by a gradual process of evolution the original types in response to a new environment have changed into the present species. This latter was the conclusion of Darwin, and it has been the conclusion of every thoughtful person since, whether he be scientist or Christian prophet. And let it be clearly understood that this view by no means excludes the necessity for a Divine Creator. It simply makes the life of these islands a part of the great scheme of creation, which began in the far distant past and has continued on through countless eons to the present moment. Is there anything ignoble in such a view? Does it not make of creation a process of marvelous grandeur and beauty, continuing on from age to age? In place of a Mighty Magician do we not have the Master Mind of the universe whose life is the source and sustainer of all created things?

But Darwin had only begun. Although he returned from his voyage on the *Beagle* in 1836, it was not until 1859, more than twenty years later, that he published his great book, *The Origin of Species*. He did not rush before the public with his new-born theory. He felt that even yet he might be wrong. Patiently, he devoted year after year to the accumulation of facts of observation. Scarcely elsewhere in the history of science is there a parallel to such earnest seeking after truth. When the opponents of evolution assert that "Neither Darwin nor his supporters have been able to find a fact in the

universe to support their hypothesis," it would be well for them to take down from its shelf Darwin's *Origin of Species* and acquaint themselves with the bewildering richness of the evidence, so overwhelming in its completeness that only he who will not listen can doubt the truth of this great law. The full case for evolution, we shall state a little later.

Still Darwin was not content to rest with the piling up of evidence in support of the general law of evolution. He felt that there must be some way of accounting for the process of evolution itself. But for a long time he could find no key to the solution of his problem. Although convinced that animals and plants have slowly changed from one species to another, still the mystery of how these changes came about only deepened, the more he pondered the subject. But this problem of progressive creation had been brought face to face with a master mind. Darwin viewed it from every angle. At length his attention was directed to the work of breeders in developing new variations of domesticated animals and plants. He saw that many quite different races of dogs have been bred from one wild stock. The same was true of cattle and fowls. The Shetland pony, the thoroughbred racer, and the work horse have a common parentage. Among plants, the cabbage, the cauliflower, Brussels sprouts and kale have descended from a common ancestor, the wild cabbage. And every one is familiar with the miracles in artificial breeding which have been produced by Luther Burbank. Here Darwin saw evolution taking place under his very eyes. He saw how



breeders, by selecting certain accidental variations in particular animals, are able to develop a type quite different from the parent form. And these facts gave Darwin his clue. It was quite clear to him that from the standpoint of special creation such modifications of animal and plant life could never occur. Species could never vary. But here was the fact of variation, just as it might have occurred centuries ago on the Galapagos Islands.

And yet Darwin had taken only the first step. It was all very well to produce variations in species by artificial selection, but what in Nature could take the place of the breeder, the conscious director of the process? Then one day Darwin chanced to read Malthus' famous essay on Population, and this happy circumstance gave to him one more key to the solution of his problem. The keen struggle for existence between the constantly increasing populations of the globe, so vividly pictured by Malthus, was just the factor needed by Darwin to complete his explanation. This now famous theory rests upon four factors, each of which is an undisputed fact: variability, the struggle for existence, natural selection, or the "survival of the fittest," and heredity.

It should not be forgotten that Alfred Russell Wallace, a distinguished contemporary of Darwin, independently put forth a precisely similar theory at practically the same time. The magnanimity displayed by each discoverer toward the other is a beautiful incident in the history of science.

As to *variability*, it is a matter of common observation that the individual members of any species

always differ slightly among themselves and from the parent members. No two individuals are exactly alike.

The *struggle for existence* is an outstanding experience of all life, in all environments, the world over. Keen, often ruthless, never-ceasing, with a sweep that includes all living forms, wielding a scepter of imperial authority,—this arbiter of the tides of life, constantly sifting and selecting, seems to decide upon which individuals shall be conferred the privilege of continuing the life stream through succeeding generations and which shall be fated to return quickly to the source from which they sprang. A little reflection will serve to show that many more offspring are produced than can possibly survive. As Professor Scott, of Princeton, says, “if every egg of the herring should develop to an adult fish and reproduce in its turn, it would not be long until the Atlantic Ocean would fail to contain them.” Considering the human family, if we place a generation at twenty-five years and allow four children per family, the descendants from a single pair, barring death by accident, disease, or starvation, would in one thousand years reach the staggering total of a million million individuals. In a certain field there may be growing a thousand plants. Putting the number of seeds per plant at one hundred and assuming no mishaps, we should expect one hundred thousand plants the following season. Yet examination discloses that at the end of the season there are still but one thousand adult plants. What is the explanation? We must find it in the struggle

for existence. Accident, disease, or starvation have claimed ninety-nine out of every hundred plantlets. That particular field did not afford room and sustenance for more than one thousand mature plants. And this serves to illustrate the biological law that, eliminating unusual life conditions, the number of adult members of any species remains practically the same from year to year. Therefore, we see that in this competition for food, air, light and suitable living conditions, as well as in the resistance to voracious enemies and the ravages of disease many must die. This seems to be a fundamental law of life. The incident of death looms large as a necessary factor in the survival of any species. "Many are called, but few chosen."

But the big factor in Darwin's explanation of evolution and the one which will forever be inseparably associated with his name is *natural selection*, or in the more fitting phrase coined by Herbert Spencer, the *survival of the fittest*. And yet what determines which offspring shall survive and which shall perish? What constitutes the magic wand of fate? Is it a mere matter of chance, or does some definite law or process govern in this border-land of life and death? What separates the sheep from the goats? What selects the fit and rejects the unfit? For the most satisfactory answer to these perplexing questions, we are indebted to Darwin and his theory of natural selection.

Let us illustrate. Suppose we were to consider one hundred individuals, exactly alike in every respect. It would then be a pure matter of accident

as to which would survive and which would die. But individuals are never identical. There is always the inevitable factor of variability. And these chance variations may give to particular individuals a better adaptation to their environment and consequently a decided advantage in the struggle for existence. The stronger individuals succeed, while the weaker ones fail. The successful member of any group is the one which happens to be a little better adapted to his environment than are his associates. The unsearchable mystery of life and its development has endowed certain individuals with advantages over their fellows. Why this should be, science is totally unable to say, but it is thought this outstanding fact of variation becomes the arbiter of destiny and a controlling influence of tremendous import in the evolution of living forms. And thus we see that there comes about a *natural selection* of those individuals which are best equipped to meet the life conditions of their environments. We may liken the process to a sieve which eliminates the weak and disadvantageously adapted members of a race or species and preserves the fit. It was the master key which unlocked for Darwin the very ante-room to the eternal mysteries of life and its manifold changes. As we shall see, however, natural selection, in the sense of blind chance, is an utterly unthinkable explanation of evolution.

And finally, as the capstone to the edifice of evolution, we have the fact of *heredity*. Without it, there might be chance variation, but not progressive variation. Without the possibility of



transmitting to offspring those favorable characteristics which have enabled certain individuals to conquer their environment and win out in the struggle for existence, there could be no upward climb of evolution. But heredity performs precisely this service. And it is right here that Darwin's theory differs from that of Lamarck. Lamarck held to the transmission of characteristics acquired during the lifetime of the individual. But, as has already been pointed out, experience indicates that this never occurs. On the other hand, the chance variations which an individual inherits from its parents are transmissible to offspring. The cumulative effect over many generations, resulting from the continuous transmission of favorable characteristics, Darwin clearly saw would result in very extensive changes and possibly in the production of new species.

August Weismann, who died in 1914, was the scientist who first drew attention to the modification of the germ-plasm as a possible explanation of the origin of new species. A convert to the theory of evolution from his first reading of *The Origin of Species* in 1861, he will be remembered chiefly for his theories of heredity. They all centered about what he called the germ-plasm. By this is meant that particular part of the germ-cells which transmits from generation to generation the heredity factors. He held that this hereditary principle is absolutely continuous from the present time back to the earliest generations of living things. In substance, all of his major propositions as regards the germ-plasm

theory are accepted by scientists. As a result of extensive experiments covering many generations, he became convinced that acquired characters are never inherited by offspring. The question is not now as to whether such characters may be transmitted, but whether environment can so modify the germ-plasm as to produce changes in subsequent generations. Weismann admitted that this might be true, but contended that the character of such changes is wholly unpredictable. In this view, later scientists concur. Environment, however, may have a larger influence than Weismann was willing to concede. It is interesting to know that this early apostle of evolution was an even stronger advocate of natural selection than Darwin himself.

Here at last was a workable theory of evolution. Even after more than a half-century of hostile criticism and merciless attack from theologian and scientist alike, natural selection stands to-day as the most plausible *descriptive* explanation of the process of evolution that has yet been set forth. Given simple forms of life with the inherent capacity to variation in their offspring, together with a keen struggle for existence and the fact of heredity, and we can easily see how through vast periods of time successive species may originate. Starting with the invertebrates and passing through the fishes, amphibians, reptiles, birds and mammals, the life line culminated in the appearance of man, "a little lower than the angels, crowned with glory and honor."

That there are many obscure points in the appli-

cation of natural selection to the actual process of progressive creation, even the most ardent adherents of this doctrine will not deny. This fact, however, in no way challenges the overshadowing truth of evolution itself. That stands in its own right. About it there is not the slightest doubt. Whatever obscurity prevails simply means that as yet science sees through a glass darkly. Men have not been able to formulate a theory big enough to encompass the Infinite and to disclose in detail the manifold workings of the divine process of creation. Sketched against the background of the ages, we see in shadowy outline the salient features of a great law. We have come within sight of God. But that our persistent knockings at the door of knowledge will ever wrest from the Infinite the eternal mystery of life is altogether improbable.

With the announcement of Darwin's theory in 1859, a tremendous storm broke loose. Man did not like to be dethroned from his exalted position as a being distinct in his origin from the teeming life of the sea, the beasts of the jungle, and the fowls of the air. Theologians felt that this latest assumption of science was an unwarranted invasion of their sacred domain of divine privilege and authority. Not since the days of Galileo had such a terrific battle shaken the scientific and theological world. The bitter and intemperate denunciation of Darwin knew no bounds. The thunderings of the pulpit against his alleged "attempt to dethrone God" and to establish "a brutal philosophy" are being reechoed to-day by religious enthusiasts in their last stand for a cause

which was lost a half-century ago. Many pages might be filled with the frenzied statements which emanated both from the Protestant and the Catholic churches. But it was all to no purpose. Lyell, the great Scotch geologist, and a devout Christian, after a careful weighing of the evidence, reluctantly announced his complete conversion to the Darwinian view. Huxley, Spencer, Hooker, Gray and Haeckel, the leading scientists of the time, quickly followed. Especially did Thomas Huxley become the most able defender of the outposts of the new scientific position. But the facts were with the general theory of evolution, and, as facts are stubborn things, they won.

Gradually, as the years passed and the smoke of battle cleared away, the theologians discovered that the new belief did not destroy their religious faith after all. The overwhelming weight of evidence had begun to tell. Men found that they could not retain their intellectual self-respect and still cling to the literal truth of the legendary stories of Genesis. The spiritual truth of these poetic interpretations of the fundamental fact of creation was as great as ever, but, as a tenet of theological belief, this dogma of a letter-proof revelation of the divine process passed into eclipse. Slowly the truth and beauty of the new conception of creation took hold of the minds of men. Temple, the Bishop of London, and one of the most influential thinkers of that time, announced his acceptance of the new revelation in the following words: "It seems something more majestic, more befitting him to whom a thou-



sand years are as one day, thus to impress his will once for all on his creation, and provide for all the countless varieties by this one original impress, than by special acts of creation to be perpetually modifying what he had previously made." When Darwin died in 1882, so complete had been the victory for his views that he was accorded by common consent a burial place in Westminster Abbey beside the grave of Sir Isaac Newton.

The theological controversy seemed at an end. The truth of evolution had won a sweeping victory. No one dreamed that the first quarter of the following century would see the dying embers of this burned-out struggle fanned into the passionate and fitful flames of unreasoning fanaticism and religious zeal. But while the intellectual classes early became reconciled to the new view of creation and were easily convinced by the evidence, the masses apparently did not sense that there had been any battle at all. And, when they awoke to the implications of the new learning, it seemed to many of them that the bed-rock foundation of their religious faith was slipping from beneath their feet. Taking advantage of this situation, certain church leaders, styling themselves Fundamentalists and harking back to the unenlightened days of the Middle Ages, have sought to gain a temporary victory for reaction and ignorance. But they have ranged themselves in defense of a cause which has lost every important battle in the history of Christianity. In these religious zealots we see reincarnated the spirit of bigotry and intolerance which burned Bruno at the

stake, persecuted Galileo, brought about the horrors of the Inquisition, sanctioned the frightfulness of witchcraft, opposed the amelioration of human suffering through the advance of medical science, and sought to thwart intellectual growth and the evolution of the human soul. But these abortive efforts can not long stay the triumph of a cause whose truth is "as red as blood, as certain as sunshine, as vital as the tides of spring, as powerful as gravity, with a victory that is inevitable."

Truth crushed to earth shall rise again;  
The eternal years of God are hers;  
But Error wounded writhes with pain,  
And dies among his worshippers.

The dead hand of the past can not long fetter the living present. It is as utterly futile to attempt to stay the march of scientific progress or turn back the hands of Time to the dark night of medieval superstition as to seek to prevent the rising of the tides. Dogmatism has had its day. Its sun has set. The geography of the ancient world has been refashioned in the light of the discoveries of Columbus and Magellan. The heavens of the early church have been superseded by those revealed through the telescope of Galileo. The movements of the heavenly bodies have been brought under the majestic sway of Newton's universal law of gravitation. Fetish has given place to enlightened medical research and the miracles of modern surgery. The atoms and the molecules are yielding up their age-old secrets of energy and matter. The boundless ether carries the human voice to the uttermost parts of the earth.

The sun of truth, both spiritual and scientific, is risen. The mists of ignorance, doubt and superstition can not long obscure its rays. And we may confidently believe that the divine law of evolution, linking as it does in one majestic plan of creation the formless chaos of the fire mist with the God-conscious soul of man, will in the no distant future receive, from scientist and Christian prophet alike, the world-wide recognition of its sovereign sway. The very march of scientific and spiritual progress is in itself an evolution of human knowledge. It is, indeed, a manifestation of the "life of God in the soul of man."

#### THE DARWINIAN VIEW TO-DAY

It can not be emphasized too strongly that the fate of evolution is in no way bound up with the success or failure of the Darwinian theory of natural selection. Among scientific men, Darwin's particular explanation of the biological facts of the geologic past and the dynamic present finds many opponents, but the broad outlines of evolution are established beyond the possibility of successful refutation. William Bateson, one of the foremost scientists of England, said in a recent address at Toronto: "Our doubts are not as to the reality or truth of evolution, but as to the origin of *species*, a technical, almost domestic problem. Any day that problem may be solved. The discoveries of the last twenty-five years enable us for the first time to discuss these questions intelligently and on a basis of fact."

As to the early, or even ultimate, solution of the fundamental problem of the origin of species, Professor Bateson is probably too optimistic. Beyond question, we shall learn more concerning the mechanical factors of the process, but the ultimate cause can not be stated in mechanical terms. The simple fact is that, when man attempts to fathom the unsearchable mystery of creation itself, the problem is too stupendous for his finite powers. The only adequate explanation is Divine Intelligence, working in and through the manifold forms of energy and life. The defenders of natural selection can never explain on any mechanical basis the real cause of the vital changes in the germ-plasm and the consequent variations among the individual members of a species. This is the crux of the whole matter. We can not escape it. God is just as essential to the production of these changes,—changes without which evolution could never have started,—as he was for the creation of the Hebrew world according to Genesis.

The theory of natural selection says: *given* a tendency to variation, the struggle for existence, and heredity, and Nature will select and evolve on a constantly ascending curve of development the multitudinous species of animal and plant life. Yes, but who gives this inherent tendency to variation? There must be an adequate cause. Life without a source, a self-running vitalistic system, is as impossible in the world of living organisms as is perpetual motion in the realm of mechanics. Back of it all we *must* place the Supreme Lawgiver of the universe.



And what is Nature but a manifestation of God? The factors in the theory of natural selection undoubtedly give a more or less truthful *description* of God's method of creation, but let it be emphasized that they are only description. For the poetic, legendary account of creation, as given in Genesis, evolution substitutes the undisputed facts of scientific investigation. But back of it all must stand the Thought and Purpose and Intelligence of an Infinite Creator.

The very expression "survival of the fittest" implies purpose. An organism must be fit for something,—fit to live, fit for its environment, fit to take its place in the vast scheme of creation whose beginning and end are beyond the limits of our imaginations. The language of evolution itself is full of the idea of personality. Natural selection implies a selector, and we can not relegate this fundamental factor of the process to the blind chance largely involved in the struggle for existence. No, we can not get away from the idea of God. Just as in the days of the Hebrew prophet, He is still the overshadowing fact of all existence. Just as in artificial breeding man must select those characteristics which he wishes to develop, so in Nature must the inherent Purpose of the Infinite produce and select those variations which will make for divine progress.

Finally, there is very much for which natural selection seems totally unable to account. To cite just one example, natural selection, if it is to become an adequate and workable theory, must account for the perfect development of such a delicately ad-

justed organ as the human eye, and that by a series of chance variations which must run the continually repeated risk of obliteration through cross-breeding. Under such requirements, the sheer inadequacy of the theory at once becomes apparent. The inevitable rule of law which seems to control these progressive changes is too big to be explained without assuming a Divine Lawgiver. Natural selection is undoubtedly a large factor in the process of evolution, but that it is an all-sufficient explanation few scientists would now wish to assert. To hold that natural selection alone is the "workman, or architect, that selects or rejects" from the inherited variations of individuals those which make for evolutionary progress is to credit the blind chance of a mechanistic process with achievements so marvelous that it is unthinkable that they could be accomplished by anything less than Intelligent Purpose. Natural selection, important as it is, is but a single phase of the Divine Plan of Creation.

#### LATER THEORIES

Hugo De Vries, a Dutch botanist, has thrown new light upon the process of evolution, but the inscrutable mystery of it all is as deep as ever. Some twenty years ago, while botanizing in his native country, he discovered that here and there a certain primrose, which had been introduced from the United States, would suddenly and with no apparent cause give rise to an entirely distinct species. This truly remarkable occurrence led De Vries to conduct a series of experiments in his Botanical Garden, running over a period of a number of years,

The result of these elaborate experiments was the discovery that now and then an entirely new sort of individual would suddenly appear in a pedigree. De Vries bred from that flower fourteen new permanent varieties. These inexplicable changes in the plant forms, De Vries called "mutations," and he used them as the basis of a new explanation of evolution.

De Vries holds that it is not the small variations among individuals which determine the course of evolution, but these sudden and larger mutations. Otherwise, his theory agrees precisely with Darwin's. And yet Darwin recognized that theoretically new species might suddenly arise. It is believed that these mutations are transmitted through the germ-plasm of the parents, but as to their real cause we are as much in the dark as ever. Mutations, both among plants and animals are an undoubted fact, but why they should occur, no scientist can say. To understand them we should have to know what God is. In the words of Tennyson,

Flower in the crannied wall,  
I pluck you out of the crannies,  
I hold you here, root and all in my hand,  
Little flower,—but *if* I could understand  
What you are, root and all, and all in all,  
I should know what God and man is.

Mutations are interesting as evidence of the probable way in which new species have occurred in Nature, but nothing more. As Professor William B. Scott, of Princeton, says in his *Theory of Evolution*, "Interesting and important as the mutation theory

undoubtedly is, it offers no explanation of the phenomena, for the cause of such sudden changes remains a complete mystery. The seat of the change, it can hardly be questioned, must be sought in the germ-plasm of one or both parents, but we have not the least inkling of how such modification is brought about.”\*

And when at the end of the journey, this search for the hidden cause of life and its manifold changes brings us face to face with an insoluble mystery, what else can man substitute for this eternal question mark of the ages, except God?

Back in the 'sixties of the last century, Johann Gregor Mendel, an Austrian monk, carried out some epoch-making experiments in which he discovered important factors involved in the laws of heredity. But, again, these investigations have thrown little light upon the fundamental problems of evolution. In some respects, they have even complicated it. Unquestionably these Mendelian laws, which we can not describe here, are immensely valuable to breeders and of the utmost significance to the science of genetics, but they have opened no new door to the ultimate explanation of this master law of creation. As well seek to understand the essence of the law of gravitation or the inmost secret of electricity as to compass the origin and evolution of life.

Let it be said, too, that while scientists know much more about evolution than was known a half-century ago, there is much less certainty as to the

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\*The Macmillan Company, 1917.



controlling causes. The various theories do not fully explain. Men are still groping for the truth. Yet, we may say with perfect confidence that, whatever may be the discoveries of the future, no explanation can ever supersede the necessity for a Divine Being as the energizing source and immanent guide of all creation.

#### THE EVIDENCES OF EVOLUTION

Now let us look for the evidences of evolution itself. There we shall be on sure ground. We shall not be seeking to explain the mystery of the process, but simply to discover the fact of ceaseless organic change, as it is written in the fossil dialect of the rocks and revealed in the abundant evidence from other sources. But, judge and jury that we are, let us approach this case with an open mind and listen to the evidence with an impartial ear.

#### THE EVIDENCE FROM CLASSIFICATION

One of the chief functions of botanists and zoologists in the early days of the science was the classification of animals and plants. And this work is still a fascinating and important branch of biological pursuits. After a prodigious amount of critical study, living forms are arranged in groups known as species, genera, families, sub-orders, orders, classes, and branches, or phyla. We need not be frightened at this somewhat formidable array of terms. Let us illustrate their meanings with examples. We will start with the European wolf and follow him along this ascending order of groups wherever he may

lead us. First of all, he belongs to the species known as *Lupus*, which is the Latin word for wolf. All the members of this species are more like one another than they are like other kinds, or species, of wolves. Still there are some other species, each given a Latin name, and all of them are placed in the genus called *Canis*. It is interesting to know that dogs, believed to be domesticated wolves, constitute one species of this genus. Now the true wolves, jackals, foxes and many other dog-like animals are grouped together in one family named *Canidae*. All of these forms are more or less related to such beasts of prey as cats, bears, otters, raccoons, weasels, etc. Therefore these families are all placed in a sub-order known as *Fissipedia*. You will note that the relationship constantly becomes more remote, the further up the scale we go. These terrestrial forms are now joined with such marine animals as seals, sea-lions, walruses, etc., to form the order designated as *Carnivora*. This order, together with several others, which have many characteristics in common, is placed in the class named *Mammalia*. And finally this class of mammals is grouped with several others in the one big branch of *Vertebrata*, or vertebrates, distinguished for having a backbone.

Let us next consider that there are just two ways of explaining the relationships existing between these various groups: the Biblical method of special creation and the scientific method of evolution. If species have appeared upon the earth in response to a distinct act of special creation in each case, then

these seeming relationships are wholly ideal, or arbitrary, and there is no real kinship between the different species of a genus. That is, species were absolutely fixed by the Creator in the beginning and there never has been and never can be any instance of the origin of one species from another. This was the view which prevailed down to the time of Darwin.

The first investigator to find a stumbling-block to the acceptance of this theory of special creation was Lamarck. He was the first scientist to undertake a thorough and systematic classification of the lowly forms of animal life, known as invertebrates. But he soon found that the clear distinction of one species from another was often an exceedingly difficult thing to make. And this has been the experience of every similar investigator since. The wide variations among the individuals of a single species and the almost insensible gradations of the species of the same genus into one another make this work of classification a problem of marvelous complexity. Indeed, Lamarck came to the conclusion that there is no hard and fast line between species, and, even, among scientists to-day, there is often a radical difference of opinion as to how many species should be recognized in a particular genus. The rapid response of species to a change of environment and the wonderful "plasticity" which they display under such circumstances greatly complicate the problem.

Now, is it not perfectly clear that on the basis of special creation these intermediate differences among the species of a genus are very difficult of

explanation? But, on the other hand, the simple evolutionary changes in the individuals of a species in response to environment and as a result of hereditary variations offer a perfectly plausible and natural solution of the difficulty.

Shall we still hold to the hypothesis that in the beginning God created all of the distinct species, just as they are now, and that they have never varied and never can? Biologists have already classified about five hundred thousand living kinds of animals and two hundred and fifty thousand living kinds of plants, and there are many more to classify. Do you not see what a stupendous problem is involved in the theory of special creation? What wide diversity of geographic and climatic conditions must have prevailed in the Garden of Eden!

#### EVIDENCE FROM DOMESTICATION

Whatever may be the verdict concerning this first link in the chain of evidence, let us consider the inferences which may be drawn from the wonderful results obtained in the domestication of animals. We have already pointed out that the various breeds of cattle, horses, sheep and fowls have in each instance descended from some common wild ancestor. Dogs are domesticated wolves and are classed as a single distinct species. And yet, if a zoologist were to find the pointer, terrier and spaniel dogs, for example, living wild in a state of Nature, he would not hesitate to pronounce them as belonging to separate species. If the theory of



special creation is correct, how have these modifications from the common wild ancestor come about? There is no escape from the conclusion that they would have been impossible.

Among domestic pigeons, there are over two hundred well-marked breeds, and there is abundant evidence that they all descended from the wild rock-dove. We are all familiar with the plant creations of Luther Burbank, such as the primus berry, the stoneless plum, the spineless cactus, and the Shasta daisy. All of our ordinary varieties of wheat have been developed since the days of the polished stone age from a single ancestor, now found growing on the slopes of Mount Hermon. The romance of the Fife wheat is but a single episode in the progress of evolution in very recent times.

As additional evidence from the work of domestication, let us relate the interesting story of the Porto Santo rabbit. About 1420, a Portuguese navigator set free on the island of Porto Santo, not far from Madeira, a doe with a litter of young rabbits. These rabbits belonged to a domestic race which had descended from the European wild rabbit. So rapidly did they multiply that within forty years they were described as "innumerable." And, in the four and a half centuries since, they have changed so completely from their original ancestor that they have been described by Ernest Haeckel, the great biologist of Jena, as a distinct species.

A host of additional examples might be given, but these are sufficient. Is it not fair to ask if these instances of the modification of species are not very

substantial evidences of evolution now going on? And if man has been able to accomplish so much within such a comparatively short time, what miracles of evolution may not have been achieved with God throughout the countless eons of the past?

To the question so often asked: "Why has evolution ceased?" we may answer: "It has not ceased."

#### EVIDENCE FROM COMPARATIVE ANATOMY

Professor Le Conte, in his *Evolution and its Relation to Religious Thought*, says:

"It is impossible to exaggerate the closeness between man's body and the animal kingdom, from a structural point of view. . . . Man's body is identified with the body of all animals in its functions, with all vertebrates, especially mammals, in its structure. Bone for bone, muscle for muscle, ganglion for ganglion, almost nerve-fiber for nerve-fiber, his body corresponds with that of the higher animals. Whether he was derived from such animals or not, certain it is that his structure, even in the minutest details, is precisely such as it would be if he were thus derived by successive slight modifications."\*

That is what is meant by comparative anatomy. Within the animal kingdom, we find several distinct types of architecture. Each type exhibits within itself an almost endless diversity in the details of structure, and yet there may be clearly perceived one common, fundamental plan. Just as in a musical composition a single theme may be discovered running throughout all of the variations of the pro-

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\*By permission of D. Appleton & Company.

duction, so does one dominating scheme pervade the structural organization of a particular group of animals.

Let us illustrate. Strange as it may seem at first thought, a careful examination discloses that the human arm and hand, the flipper of a whale, the wing of a bird, and the fore leg of a lizard are identical in their general plan of construction. Or, we may take the limbs of a turtle, a bear, a monkey, a bat and a mole. Muscle for muscle, bone for bone, in every instance they are essentially the same. The differences which exist are superficial, not fundamental. What is the meaning of the two sets of teeth in the whalebone whales,—teeth which never even cut the gum? Are they not to be regarded as relics of useful teeth which their ancestral forms possessed?

Now these similarities of structure unmistakably point to a common origin, and descent with modification. They indicate blood kinship. But on the basis of special creation, they simply have no meaning. From the popular standpoint, this kind of evidence is not so conclusive as is that from classification and domestication, and yet these facts of comparative anatomy are just exactly what we should expect as a result of evolution.

#### THE EVIDENCE FROM EMBRYOLOGY

With the coming of the compound microscope and its application to biological research, it became possible to trace in minute detail every stage in the development of an embryo from the simple one-celled

egg to the mature individual. And this work has led to the very remarkable discovery that all the vertebrated animals,—fishes, amphibians, reptiles, birds and mammals, no matter how varied they may be in their habits of life, are amazingly similar in their embryological development. In a most striking way this discovery indicates the kinship of these various forms. The individual in his development from the egg to the mature state repeats in abbreviated form the history of his ancestral lineage.

The embryology of man, step for step, is almost precisely like that of the other primates, and particularly like that of the anthropoid apes. Not only this, but many structural features which become permanent characteristics in the lower forms of life appear as transitory stages in the evolution of the human embryo. Thus, the heart is first like that of a fish, then like that of an amphibian, and only finally develops into the four-chambered form characteristic of mammals. More significant still is the appearance, while the evolving veins, arteries and heart are in the fish-like stage, of four pairs of well-marked gill slits. After persisting for some time without serving any useful purpose, they gradually disappear. The nervous system, the alimentary system, the excretory system, and every other system exhibits a precisely similar evolution. In their early stages of development, these various organs are identical with those of lower forms. Even the microscope will not disclose for some time into what type of animal an embryo will develop. At one stage the human embryo exhibits a well-formed tail,



and even in the adult this one-time appendage is preserved in rudimentary form in the fusion of the four or five vertebræ forming the "coccyx." A complete coating of embryonic hair also appears, which passes off long before birth and which does not seem to serve any useful function. Other examples might be cited. The wing of a bird, for instance, can not be distinguished, at one stage, from the fore limb of a cat.

Another line of evidence closely related to the foregoing is that of rudimentary, or "vestigial" structures. Such structures are undeveloped organs which still persist in animal forms, although they have no apparent use whatever. The hind limbs of the whale, the thumb of the bird, and the splint bones of the horse are examples. Man himself is a "veritable walking museum of antiquities." He is said to possess nearly two hundred such vestigial structures. In the inner upper corner of the eye is a minute tag, which is the last vestige of the third eyelid, occurring in well-developed form in most mammals and serving to clean the front of the eye. Among other human vestiges, may be mentioned the vermiform appendix; a complicated set of muscles similar to those employed by other animals for moving their ears, but having no use in man; the abbreviated tail with its set of caudal muscles; and the embryonic vestigial gill slits.

What is the explanation? Why do we have so many features in our bodies which are so much like corresponding features in the bodies of other animals? Why do we pass through, in the embryologi-

cal development of each of us, so many stages that are like stages passed through in the development of other vertebrates? Are we not correct in assuming that in all this the individual recapitulates the ancestral history? Inheritance, it is thought, accounts for the occurrence of these organs; lack of use prevents their development or causes them to disappear. In the early stages of the evolution of the individual, these organs did have a use, which heredity stubbornly refuses to forget, and so we find them perpetuated in a functionless rudimentary state. The theory of evolution gives a logical, almost irresistible, explanation to these interesting facts of scientific investigation.

But what has the hypothesis of special creation to offer? It either is content to deny the facts or blindly shuts its eyes to them. It has no explanation, other than to say that these things simply are so, which is the giving up of explanation. But facts are stubborn things, and they must be accounted for. Evolution is the only answer.

A simple illustration will serve to make clear the scientific explanation. I have in mind an office building which shows unmistakably that it was at one time a dwelling house. The vestibule and hall, the winding staircase, the archways, the fireplaces, the size and arrangement of the rooms, the windows, and much more all betray its residential character. Are we to assume that the architect who designed this building deliberately introduced features which are appropriate only to another order of architecture? The answer and likewise the aptness of the illustration are obvious.

## THE EVIDENCE FROM BLOOD TESTS

“Blood will tell.” Since the time of Darwin, a new type of evidence has brought a wealth of confirmation to the evolutionary theory of man’s ancestral lineage. It has come from blood tests and demonstrates the kinship, or lack of it, existing among different animals. Although these blood differences and similarities have long been known to exist, chemical analysis would not reveal them. Scientists sought a method that would, and at last they found it.

An “anti-human” serum is prepared by injecting the serum from human blood into the veins of a rabbit. After a few days the rabbit is killed and the serum from his blood is found to be a wonderfully delicate test for human blood and also for the varying degrees of relationship existing between human beings and lower types of life. Now, when a little of this prepared serum is mixed with the serum from human blood, a precipitate, that is a solid substance, will at once form. But, if this serum is mixed with that from the blood, for instance, of a domestic animal, such as a pig, a sheep, or a fowl, no reaction occurs. When mixed with the serum from the blood of the anthropoid, or man-like apes, this indicator gives a distinct precipitate, although it is less abundant and somewhat slower in forming. Definite but less abundant reactions are obtained with the blood of both Old-World and New-World monkeys.

In like manner other serums may be prepared which will detect with a high degree of certainty the

relationships existing between any desired groups of animals. The result has been to show an unmistakable kinship among all mammals, for instance, and to confirm in a most striking way, wherever these tests have been applied, the conclusions with regard to the truth of evolution drawn from other sources of evidence.

Such discoveries as these are of immense significance. Only he who does not wish to believe can doubt their import. In them we have unmistakable proof of our lowly origin. Whether such proof is pleasing or displeasing, we must accept it.

#### EVIDENCE FROM PALEONTOLOGY

Paleontology is the fascinating science of ancient life. We have seen how the fossil record of these extinct forms laid the foundation for the theory of evolution. But long before this theory had come to the fore, geologists through a study of fossils had divided the past history of our earth into a series of eras, periods and epochs. In the oldest rocks occur the simple forms of invertebrate life. The Paleozoic seas of that unimaginably remote time are shown to have been swarming with a great profusion of living things, simple and primitive in structure. Some of them, as the mollusks, brachiopods, and sea-lilies, belonged to types still living. Trilobites, a sub-class of crustaceans, are wholly extinct. Spiders and scorpions, and insects, such as cockroaches and dragon-flies, abounded. Thousands of extinct species of fossil forms have been discovered and described. But even before this era we know



that there was the primordial life of the inconceivably long Archæozoic era of which we have no record.

In the early rocks of the Paleozoic era we find the first fishes, followed, as we pass upward, by amphibians and finally toward the close of the era by the rise of reptiles. The appearance of amphibians shows that life was emerging from the seas and invading the land. These animals, too, represented a distinct advance in structure, and with them came the first sound upon this planet of an animal voice. The reptiles, one hundred per cent. land animals, not breathing by gills in any stage of their development and wholly free from water, represented a still greater advance in structure over their humble predecessors. The prolonged ice age which marked the close of this era caused the complete extinction of many ancient types.

The succeeding Mesozoic era has often been termed the "Golden Age" of reptiles. These huge, hideous-looking monsters radiated in many directions and adapted themselves to many haunts. Fish-lizards, swiftly gliding alligator-like types, and flying dragons abounded in great variety. The *first known* bird, the *Archeopteryx*, has been found in Bavaria in rocks belonging to this era. With the exception of the breast bone, every bone in the body was found, and the rocks even preserved the impress of the feathers. Flying reptiles, known as pterodactyls but not true birds, were a feature of this far-off time. Some of the later reptiles of this era began to exhibit the characteristics of mam-

mals, and before its close this next higher class of animals was well established.

In the Cenozoic, or recent era, the mammals came into their own. Like the reptiles before them, they conquered every haunt of life. Many types, such as the woolly rhinoceros, the mammoth, the saber-toothed tiger, the cave-lion, and the cave-bear have become extinct. A constantly ascending scale of intelligence is seen in the development of mammalian life throughout the era, particularly in the monkey-ape-man, and finally in the inter-glacial epochs brute man himself appeared. Gradually both animal and plant life assumed its modern aspect and man through long centuries won his mastery of the earth.

In a number of instances complete fossil pedigrees, connecting present types of animals with their extinct ancestral forms, have been discovered. This is true of the horse, the elephant, the camel and the rhinoceros. From *Eohippus*, the first horse-like ancestor, measuring only eleven inches high and found in deposits belonging to the grass-covered American plains of early Cenozoic time, there exists a complete series of intermediate fossil forms. A wonderful exhibit, showing this historical development, is to be seen in the American Museum of Natural History in New York. An interesting incident connected with the development of this history occurred when Huxley, on a visit to this country, was lecturing in New York. He traced the ancestry of the horse, as it was known at that time, and predicted that, if the next fossil form in order were ever



*Courtesy The American Museum of Natural History.*

#### EVOLUTION OF THE FORE FOOT OF THE HORSE

Fossil remains of the horse go back for three million years. Starting with a four-toed animal no bigger than a cat, a perfect series of the most notable geological discoveries ever made portray his evolution to the modern horse, each of whose hoofs has developed from a single toe of the original ancestor.





discovered, it would have certain characteristics, describing what sort of an animal it must be. Within six months after Huxley's return to Europe, Professor Marsh of Yale discovered this animal's remains in Colorado, and they matched exactly the description which the distinguished scientist had given of them. Does it not seem true that a theory which is able to make such verifiable predictions has something more back of it than mere chance? Does it not show the presence of God in Nature? Can we not see in this modern prophecy and its fulfilment the revelation of a divine law?

Putting aside all previous ideas, assuming that you had never heard the Story of Creation,—what interpretation would you place upon these facts of the geologic record? What would these succeeding cycles of constantly progressing life forms mean to you? Could you give any other explanation than "creative evolution" directed by Intelligent Purpose? The Bible story does not contain this geologic record for the simple reason that it was not known at the time the Bible was written. Even assuming that God actually dictated the Bible account, of what use would it have been to give scientific facts of this sort to primitive folk? They would not have understood them. The Story of Creation was the only explanation which those simple-minded people could understand, but we are not bound to retain it in the light of the contradictory scientific revelations of the twentieth century.

And why try to teach our young people in their religious training a theory of the origin of life which

is so completely discredited by a wealth of evidence obtained from their science studies? Does, not, too, the experience of the past demonstrate the utter futility of attempting, either by ecclesiastical or legislative decree, to prevent the teaching of the truth? No one has ever been able long to suppress it. It is as irrepressible as the slumbering fires of Vesuvius.

#### THE EVIDENCE FROM GEOGRAPHICAL DISTRIBUTION

We have already seen that it was the geographical distribution of extinct and living forms of animal and plant life in South America and on the Galapagos Islands that led Darwin to the adoption of the theory of evolution. There is an abundance of other examples of similar evidence. The life on the island of Madagascar, at one time connected with the African mainland, is very markedly different from that of the parent continent. During the long period of separation, species which were originally identical, have evolved into new forms. There is no escape from this conclusion. On the other hand the British Isles have so recently separated from the continent of Europe that new species have not had time to develop.

It is an interesting fact that on oceanic islands far-removed from continents only those forms of life are found which could be borne to them by wind and wave. Only such birds as can be carried long distances by strong gales appear. The fauna of such islands contain no mammals except bats. And

in every instance the life, both plant and animal, is similar to that of the nearest mainland, yet differs from it in having distinct species. If special creation accounts for these forms, why are they not identical with those of the mainland? There is no answer. But evolution affords a simple and inevitable explanation. And if we admit that the original forms of life came from the mainland and have since changed into new species, then the case of evolution is established.

That islands do receive life in this way is proved by the case of the island of Krakatoa. In 1883, half of it was blown away and the other half was buried in volcanic dust so deep that every living form perished. But in a surprisingly short space of time the island was revegetated, and repopulated with a great variety of insect life, all borne from the islands of Java and Sumatra.

On the mainland, animals have been known to spread for great distances from their original habitats, and groups have frequently become isolated. As a result, after long periods of time new species have arisen. As an instance of this rapid migration, we may mention the case of the horses set free about 1537 from Buenos Aires, upon the abandonment of the first settlement at that place. In forty-three years, it is said, they had spread to the Straits of Magellan, nearly a thousand miles distant.

#### CONCLUSION

You have heard the evidence. What is your verdict? Remembering that only two explana-

tions—special creation and evolution—have ever been advanced, which more nearly fits the facts? Should we longer fetter our minds with an outworn legendary belief which was never intended to be regarded as literal scientific truth? Must we not accept things as they are and cease distorting the facts to suit some dogmatic theological view? Sentiment and prejudice are unsafe guides in answering such questions. Only our God-given reason, which elevates us above the beast, can give the answer. And we must remember that our decision has nothing to do with the theories advanced to explain the process. It is concerned only with the fact of evolution itself. Has there been a divine process of ceaseless change “through ever enlarging cycles and higher levels,” or do you wish to believe that the whole universe, including all forms of life as they exist to-day, were miraculously created in a few brief days of very recent time? And let it be pointed out that the idea of special creation is an *hypothesis* without a single fact to support it. Undeniably a legend, whose purpose was to teach the fundamental spiritual truth of an omnipotent Creator, it is an astounding circumstance that in this enlightened century of marvelous scientific achievement, this incredible belief should still grip the minds of men. Is not a purpose moving faithfully and steadily across the ages immeasurably more impressive than one which is realized in a day? Does it not enable men better to appreciate the vastness of creation and inspire them to a life of reverence in the presence of the Infinite? After all



it is not a question as to which belief we prefer, but which belief squares itself with the known facts of the universe. There is not a shred of evidence to support the story of special creation, but a bewildering array of the most authentic observations known to science proclaims the universal truth of evolution. We do not hesitate to accept at face value the latest discoveries of scientists with regard to atoms, molecules and electrons,—radio, medical research and astronomical mysteries. Why should we refuse to believe the equally valid discoveries concerning the past history of our planet and its life?

#### THE MYSTERY OF LIFE

Before me lie the tiny seeds of a common garden flower. So small that they are almost indistinguishable from one another with the eye, each of these little seeds contains a germ-cell, from which will spring a new plant, faithfully repeating in a thousand minute details the form and structure of the parent plant. And I know that the plant will produce a flower true to the ancestral type, yielding a host of tiny seeds, each one again endowed with the same marvelous potencies. How does it come about? Why do the violet and the buttercup, each, select from the same food source just exactly the elements needed for its peculiar growth and build them in accordance with its own unique pattern of beauty? What is this creative urge which enables the green chlorophyll of a living leaf together with sunlight to change carbon dioxide and water into plant cells, while in a dead leaf this transformation

is an impossibility? What is the source of this life which animates all Nature? Why this succession of seed-time and harvest throughout the centuries? Why does the "advancing year ever bring the rose of spring"? What divine force is enshrined within that "treasure-house of all the ages," the living cell from which evolves a human being,—endowed mayhap with genius and always with the God-conscious soul of man? In these questionings of the Eternal, we are face to face with the unsearchable mystery of life. To answer them, we should need to know what God is.

From whence came those first simple forms of life upon our planet, millions and millions of years ago,—forms bearing within themselves the creative impress of evolving life? Evolution has pushed this problem back to the very frontiers of creation, but still our thought is not content to rest. Life surely had a beginning, in lowly forms, in some immeasurably distant time. How did it originate? Some have held with Lord Kelvin, Helmholtz and Arrhenius that life may possibly have come to this planet from the depths of space, wrapped in the crevices of meteoric matter. But even were this true, it only shifts the burden of creation to some other spot of the universe. Others have suggested that in that far-away early period of youthful exuberance conditions may have been such that living things spontaneously evolved from non-living matter by a natural process of synthesis. Recent experiments by Professor Baly have shown that an organic compound known as formaldehyde can

be produced by the prolonged action of sunlight on water and carbon dioxide. But we are confronted with a vastly more difficult problem. It is a living organism capable of reproduction and endowed with the creative capacity to evolve into constantly higher and higher forms of life for which we must account.

Still there can be no doubt that when, in the course of that infinitely slow evolution from nebula to planet, conditions suitable for the support of life arose, living things appeared as simply and as naturally as in the springtime "the cowslip startles in meadows green." This emergence of life was but an incident in the unfolding of that divine plan which from the very beginning has held within the scope of its Infinite Purpose electrons and nebulae, stars and solar systems, cities and civilizations. And when we have carried life back to Him who is the one overshadowing fact of all creation, we can go no further. The rational mind can accept no less than Divine Intelligence as the ultimate source of an intelligible world, and of anything above and beyond that we can form no conception.

#### EVOLUTION AND CHRISTIAN FAITH

Evolution exalts the Christian faith. For the crude notion of a Master Artificer, it substitutes the Divine Immanence of all creation. It has transformed the primitive idea of God into one commensurate with the illimitable universe which science has revealed to the minds of men. This notion of immeasurable eras of time, of ceaseless growth, of

infinite resources has inspired many men with something of the feeling of Immanuel Kant when he said, "Two things fill me with unspeakable awe,—the starry heavens above and the moral law within."

Concerning the relation of science to Christian faith, the words of three of the foremost Christian prophets of modern times will be helpful. Let me quote from a letter recently received from Doctor Charles E. Jefferson, pastor of the Broadway Tabernacle in New York City. He says:

"In response to your request, let me say that in my opinion there is no real conflict between science and religion. Whatever apparent conflict there may have been, has been due to the shortsightedness and bad temper of a few representatives of both sides. Neither side is guiltless. Both sides have been bigoted and bumptious. Each side has rushed into the territory of the other and set up claims which could not be maintained. Such unfortunate exhibitions of bad manners are happily growing less and will some day, let us hope, pass entirely away. A Christian need have no fear of science. He is a professed follower of the truth, and to him truth ought to be dearer than all things else. It is the business of science to seek facts. The Christian is glad to accept them just as rapidly as they are found. The scientist is fearless in his search for the truth, and so is the consistent Christian. If loyal to Christ he has the scientific spirit. He is ever pressing on knowing that he has not attained. He longs to know more and more. He expects to be able to do greater and greater things. He tests all ideas and hypotheses, and holds fast to that which is good. If newly discovered truth conflicts with the Bible, or with the Creed, then the interpretation of the Bible and the Creed must be widened to make room for the new facts. Facts are words of the



Lord, and in these facts we get a fresh revelation of the mind and purpose of the Eternal. The Christian Church, therefore, has nothing to fear from scientific investigations. Christian leaders are in no alarm over the progress of scientific research. They are immensely indebted to science for her amazing revelations, and have been profoundly stimulated by the progressive unveiling of the material universe. The ultimate outcome of the whole scientific movement of the last hundred years will be a strengthening of the fundamental doctrines of the Christian religion, and a powerful aid to faith and hope and love."

Doctor S. Parkes Cadman, pastor of the Central Congregational Church of Brooklyn and a preacher of international renown, in reply to my request for a statement upon this subject, referred me to his book *Ambassadors of God*, from which I quote the following passage:

"Of all the theories science has put forth that of evolution was the most capable of being reconciled with Revelation. You believe, I venture to assume, that the Christian Faith is bound to take unto itself the verified wonders of creation, which are resonant with the goodness and wisdom of Deity; that the cosmos must be intelligible to mankind; and that whatever makes life more rational and therefore more truly divine should be a part of the praise which the Church offers to her Lord. Why then was not the idea of progressive development 'baptized into Christ'? The assertion that the several endowments of sentient existence, originally breathed into one or more primordial substances, were ceaselessly urged onward toward higher existence had nothing in it essentially opposed to Christian truth. Renewal, growth, fertility, contingent perfectibility; what are these but

spiritual terms imported into the natural world?—terms with which the New Testament abounds at every turn. Here, as it impresses me, was a unique opening for the attachment of the hypothesis of progressive development to the highest interests of the race. Its conscious possession and use in the Church were indefinitely postponed by the explicable but costly reaction of theologians and preachers who refused to harmonize the facts of science with the realities of faith.”\*

In another passage, Doctor Cadman speaks of the “vain attempts to transmute the poetical compositions of Genesis into actual events.”

The late Doctor Lyman Abbott, in reply to a parent’s question asking “how the theory of evolution can be reconciled to the Biblical account of creation in teaching young children,” said:

“I answer, by teaching them the nature and uses of the Bible.

“A child grows up in the home and imbibes the impression that the Bible is an infallible authority upon all subjects. His religious teaching in Church and the Sunday-school is fragmentary; no attempt is made to give him any systematic religious instruction. He therefore systematizes it for himself. The result is something like this:

“Six thousand years ago God made the world. He made it in six days and launched it on its voyage. Since that time He has done nothing more to it except occasionally to interfere with its natural operation, as in the Deluge, the destruction of Sodom and Gomorrah, and the crossing of the Red Sea. But that sort of thing He does not do any more. He made man perfect, as he made everything else perfect. But the first man disobeyed

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\*The Macmillan Company, 1920.

God, and all the disease and sin and misery in the world has resulted from that disobedience.

“This child goes to school carrying some such idea as this with him. And before he gets through the high school he finds all secular teaching set on a different key. Life is progressive. Creation is continuous. As the tree grows by a progressive process from a seed, so the world has grown by a progressive process from chaos. As the man grows by a progressive process from the babe, so the race has grown by a progressive process from a pre-historic cradle. The child’s religious impression has been that life is static, with occasional divine interventions. His entire system of school education is founded on the assumption that life is a continuous progress. There is no one to tell him that ‘evolution is God’s way of doing things.’ And it will not be strange if he rejects the Bible which has never been interpreted to him, the Church which has never interpreted itself to him, and religion which he has come to regard as a bar, not an inspiration, to progress.”\*

Similar statements might be obtained from many other of the world’s foremost Christian leaders, Doctor Hillis has already been quoted. Enlightened Christian leadership everywhere recognizes the transcendent truth of evolution and welcomes this new conception of divine revelation. In place of the absentee God of the older Church thinking, a God who set the world going and then went off and left it except for an occasional miraculous interference with its orderly operation, evolution puts the God of here and now, always creating, always speaking, always revealing Himself, and in each succeeding age more fully and more clearly. It dispels the

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\**The Outlook*, volume 130, page 290.

false idea that revelation ceased at the close of the Old and New Testament days.

Whether we look, or whether we listen,  
We hear life murmur, or see it glisten.

And life itself is a revelation of God. He is forever revealing Himself in all Nature, in every golden sunrise and gorgeous sunset, in each new spring-time with its wonderful renaissance of life, in the ripening harvest, in the glory of the heavens, in the beauty and the terror of the sea, in the perpetual flux of all creation, in the miracles of science, and in the ebb and flow of civilizations. This Divine Immanence is in us and all about us. It is the source of inspiration for every sermon and every poem, every painting and every work of sculpture; it is the soul of music and the guide of genius; it makes the inventor and the discoverer co-workers with the Infinite; it manifested itself in the prophets of old, and to-day it lives again in every scientist and searcher after truth. Evolution has brought God immeasurably nearer to the souls of men.

Speak to Him thou for He hears, and Spirit with  
Spirit can meet—  
Closer is He than breathing, and nearer than hands  
and feet.

In the words of Whittier,

I know not where His islands lift  
Their fronded palms in air;  
I only know I cannot drift  
Beyond His love and care.



Creation and, therefore, the Divine Immanence, which we call God, is everywhere. Both animate and inanimate Nature ceaselessly breathe of His presence.

Fortunately, the spiritual progress of the race does not depend upon the acceptance or the rejection either of evolution or special creation. Creation is the outstanding fact of the universe and exists independently of any human explanation. Proceeding out of the countless eons of the past and moving forward into all eternity, this ceaseless becoming embraces in the vast sweep of its infinite purpose every phase of human progress, both material and spiritual. For a few fleeting moments of cosmic time, the human race emerged but yesterday from its shadowy past, participates in this triumphal pageant of the ages. Whither it will lead no one can say. In the following beautiful lines, the poet Holmes has hinted at the possible significance of it all for the soul of man:

Build thee more stately mansions, O my soul,  
As the swift seasons roll!  
Leave thy low-vaulted past!  
Let each new temple, nobler than the last,  
Shut thee from heaven with a dome more vast,  
Till thou at length art free,  
Leaving thine outgrown shell by life's unresting sea!

## CHAPTER IV

### THE RISE OF MAN

YES, man has risen,—not fallen. That is the message of science and the gospel of the newer religious thinking. Taking his origin from a lowly ancestry, possibly a million years ago, brute man at length began to feel within his slumbering soul the first dawning consciousness of those God-given powers which were gradually throughout uncounted centuries to transform him from a creature of circumstances into the master of the earth. Beast-like in appearance, of savage impulses, thick-skulled and small-brained, cunning, skilful, vastly superior in latent native ability to his associates of forest and plain,—this uncouth progenitor of humankind, into whom God had breathed the faculty of reason, somewhere, sometime, began that inconceivably slow climb which was to bring him finally to the dawn of civilization and to the acquisition of homes and flocks and inventions and arts and laws and liberties and religions. Reveling in the easy times and genial warmth of periods of mild climate, suffering the most terrible hardships from the Arctic cold of succeeding Ice Ages, frequently perishing in vast numbers from famine and pestilence, plunged in the deepest ignorance, addicted to hideous acts of crime

and passion, subject to superstition and delusion,—these prehistoric kin of ours lived and died and, with an ever-growing faith in their divine destiny, carried forward the torch of progress until it now lights the world. That, in brief outline, is the record which the facts of science make it possible to substitute for the soul-blighting legend of the “Fall of Man.” Ascent, not descent,—soul-expansion, glorious achievement, on the whole steady progress, the promise of illimitable future possibilities,—these are what we see when we silhouette the pageant of human evolution against the background of the ages. Forward and upward has been the general trend of the race,—not created in innocence, only to fall through the original sin of the initial pair, entailing untold woes upon all succeeding generations. In place of that unnatural picture, the undoubted evidence of man’s lowly origin has painted for us the most noble spectacle of divine progress to be found anywhere in the slow unfolding throughout the ages of the Eternal Purpose back of all creation.

That this earth had been the abiding-place of man for unnumbered millenniums before the earliest date of recorded history is the verdict both of science and archeology. The date of Menes, the first of the Egyptian kings whose names are inscribed on the monuments of the Nile Valley, is placed by the most eminent authorities at from 3180 B. C. to 5004 B. C. And even then civilization was old. A vast antiquity of progressive change had preceded the first dynasties. Sculptured upon those early monu-

ments are types of the Egyptian, Israelitish, Negro and Libyan races, as clearly marked as are these types to-day. Such racial characteristics were not acquired in a decade or a century. They point to immense periods of previous evolution. The social conditions of that early time, as revealed in the sculptured and painted scenes preserved in the tombs, tell us that at the very dawn of recorded history a highly complex system of priestly, military and industrial classes, requiring long centuries for its development, had arisen. The art of engineering had reached a high state of perfection. The dikes and canals of these creative pioneers have been the admiration of all succeeding peoples. And what monuments of architecture that early civilization has left to us! The mighty pyramids, dating from an early period of Egyptian history, the colossal temples of polished granite, noble in design and beautiful in their ornamentation, and the great public edifices, worthy of the highest civilizations of later times, are eloquent memorials to a genius for stately and artistic construction unsurpassed by any other people. At the time of the oldest dynasties Egyptian sculpture was far advanced, indicating a previous apprenticeship of great duration. Glass-making, dyeing, the preparation of soap, medicines, oils and perfumes, and the metallurgy of the simple ores had become highly perfected arts. Medicine was becoming a science. The language of these versatile people, in its chief essentials, had reached the highest point of development, and at the time of the most ancient monuments they were in the



possession of writing. This imaginative race, too, had found time to look up at the stars. Six thousand years ago there were men among them with some knowledge of astronomy. The sides of the Great Pyramid are adjusted to the cardinal points of the compass with the utmost accuracy. The Egyptian year took its date from the summer solstice. Customs and laws and the religion of the land were even then deeply rooted in a multitude of prehistoric practises.

Can any one doubt that a vast period had intervened between the emergence of this people from a state of barbarism, somewhere, sometime in the shadowy past, and the attainment of the high degree of culture which we find when the curtain rises on the early civilization of the Nile Valley? For no people ever produced a civilization without an immense background of prehistoric struggle. We may be perfectly sure that, slowly and painfully, their ancestors passed through the Rough and Polished Stone Ages and the Age of Metals. Borings sunk through the slowly accumulating deposits of the Nile Valley have brought up from great depths rude pottery and other evidences of the handiwork of primitive men. These mark the lower levels at successively remote periods in the development of Egyptian art. And stretching away before the lowermost level is the long, long trail followed by the "tentative men" in their evolution from the brute state to the first faint glimmer of an awakening consciousness of creative ability. Examples of other early civilizations might be given.

No, the race is not young. Just as more than nine-tenths of an iceberg is submerged beneath the surface of the sea, so is the vastly greater portion of our history lost in the gray mists of an unknown antiquity. An appreciation of these facts discloses the wholly unreliable character of the sacred chronology, as indicated in the legends of Genesis, and emphasizes even more strongly the transcendent truth of their spiritual teaching. Utterly false, however, in the primitive idea of man's fall, the Hebrew teaching on this point stands corrected by the findings of science and the revelations of early civilizations.

#### OTHER EVIDENCES OF MAN'S ANTIQUITY

Suppose you were to find in the caves and geological deposits of a certain region chipped flints, implements of man's skill, human relics, and the evidences of primitive methods of making fire, together with human bones, all lying side by side with the bones of the reindeer, the hairy mammoth, the cave bear and the woolly rhinoceros,—animals belonging to species long since extinct and native only to regions of Arctic cold,—what would be your conclusion? Possibly an arrow-head, as has often been found, still pierces a bone of its extinct victim. And then again, if in this same region but in other deposits you should discover human remains intermingled with bones of the hyena, the hippopotamus, the saber-toothed tiger and similar animals,—some of which are now entirely extinct and all characteristic of tropic climates,—how would you explain

these occurrences? If the world's foremost geologists, too, should tell you that these deposits were unquestionably many thousands of years old, what would you have a right to infer concerning the age of man and the previous geological history of that particular portion of the earth?

Now those are just exactly the discoveries which have been made in the British Isles. Is it difficult to picture what must have happened in those islands? Scientists tell us that in Europe and North America there have been four great Ice Ages, with intervening periods of mild or tropic climate. And the geological evidence shows that the men of the Rough Stone Age were involved in those great epochs of glaciation. In one of them, primitive men must have hunted those animals of Arctic climes and, dying, left their own bones side by side with those of the beasts which supplied them with food. And then when the ice sheet receded and sunny skies and mild climates brought thither, over the land connection which at that time joined England to the continent, the animals from tropic regions, other men hunted these new beasts of prey, and unwittingly left to us the record of their deeds.

When we know that man lived upon this earth with animals long since extinct and at a time when the configurations of the continents were vastly different from what they are now and furthermore that he survived throughout long periods of great climatic changes, can we longer cling to the literal truth of the legendary story which places the creation of the earth and all therein, just as they exist

to-day, at the very recent date of 4004 B. C.? Can we not retain the overshadowing spiritual significance of that great story and still concede the undoubted truth of man's vast antiquity and his humble origin? Must our Christian faith be bound up with the fate of a totally discredited theory of creation? And does not this slow climbing upward through the ages give an added grandeur and dignity to the present state of man? Is there not something divinely majestic, too, in this conception of a Supreme Being who has controlled and directed the destinies of men from worse than savagery to civilization? Again let it be said that it is not a question of what we prefer to believe, but of what the facts dictate that we shall believe.

#### MAN'S ANCESTRY

We are already familiar with much of the evidence which links man's ancestry with lower forms of life,—the embryological development, the vestigial structures, the blood tests, and the evidence from comparative anatomy. Bone for bone, muscle for muscle, nerve for nerve, and in many other details of structure, man and the man-like apes are extremely similar. Man is much more closely related in his anatomy to the apes than the apes are to the monkeys. If man is a being distinct in his origin from all other forms of life, why this striking similarity? If we concede the relationship existing between the lower forms of animal life, why deny the validity of the unmistakable evidence of man's place in the



plan of evolution? In the closing words of his great book on *The Descent of Man*, Darwin says,

“We must acknowledge, as it seems to me, that man, with all his noble qualities, with sympathy which feels for the most debased, with benevolence which extends not only to other men but to the humblest living creature, with his godlike intelligence which has penetrated into the movements and constitution of the solar system—with all these exalted powers—Man still bears in his bodily frame the indelible stamp of his lowly origin.”

And this has ever since been the verdict of the great majority of those who have acquainted themselves with the evidence.

If we attempt to classify man according to his anatomical structure and other animal characteristics, we find that he is a vertebrate, belonging to the class of Mammals, to the order of Primates, to the family of Hominidæ, to the genus *Homo*, and to the species *Homo sapiens*. As we shall see, the remains have been found of prehistoric men belonging to other genera and to other species, all of which are now extinct.

If it should seem to some, as we proceed, that the actual remains of the earliest types of human beings are somewhat meager, let it be remembered that in that far-distant time no provision was made for the preservation of the dead. They did not often die in swamps or in places where their forms would be covered with sediments. Primitive man's last resting-place was usually in the open air at the surface of the ground, where his bones were picked by beasts of prey and his skeleton, weathered by rain

and frost and dissolved by running water, soon disintegrated and returned to dust. Only occasionally did some human form become buried in mud or gravel, and, thus protected, preserve to us the certain evidence of his early life. Not until comparatively recent times did men bury their dead in caves, which have kept their skeletons and the secrets of their lives down to the present day. But roughly chipped flints and stones, crude implements called "Eoliths," have been found in deposits which geologists tell us preceded the First Glacial Age. And we must concede that remains of man's craftsmanship are as certain proof of his early existence as would be the discovery of his human framework. We know, too, that man inhabited this earth for thousands and thousands of years before the dawning consciousness of his creative ability told him that he might adapt his hand to the shaping of simple tools designed to assist him in the struggle for existence. The finding of the fossil remains of even one primitive type of man in rock strata whose geological age is known to be at least a half million years shows beyond the possibility of doubt that men, though they were sub-men, inhabited the earth at that time. For, if one such being existed then, certain it is that there were many more like him.

Before we go further, let us make it clear that man has descended neither from a monkey nor an ape. That is not the teaching of science. Certain it is that he is related to both. All are members of families belonging to the Order of Primates, and

all are beyond question descended from a common ancestry. But whereas the lines of descent of the monkeys and the apes have kept these types in a very primitive state of evolution, the God-given faculties of reason and an ever-expanding intelligence implanted in the soul of man have granted to him the supremacy of the earth and the hope of immortality.

The Order of Primates emerged upon the earth way back at the beginning of the modern period of geologic time, just as grass was clothing the nakedness of plain and valley with a garment of green. The rock record shows that their primitive home was in the north in both hemispheres, from whence they migrated southward to Malay, India, Africa and South America. The anthropoid, or manlike, Primates are divided into four families: the marmosets, the New-World monkeys, the anthropoid apes and men. Scientists now believe that the common ancestor from which these families sprang was that of the lowest of the mammalian orders, the Insectivora. Of the family of men, the geologic record shows that there has been a number of genera, and quite possibly there are others which have not yet been discovered, for as yet comparatively little of the earth's surface has been systematically searched for early types. We of to-day belong to the genus *Homo* and to the species *sapiens*, the only living species, although a number of extinct species has been discovered.

Let us now proceed to a description of the remains of early types of men actually found upon

the earth and trace the record, incomplete and broken though it may be, down to the present aristocracy of all creation. In so doing, we should keep in mind that at some point of the inconceivably remote past, millions of years ago, the four families of the order to which man belongs branched off from the parent stock, each giving rise across vast periods of time to distinct genera and species, most of which are now extinct. Just what were the various conditions of environment and innate tendencies which, in the struggle for existence, should have given rise to such markedly different products of evolution, no one can say. To know what these were, we should need to understand the divine plan of creation. But of the fact of this order of occurrence, there is now no shadow of doubt.

#### THE AFRICAN MAN-LIKE APE

In January of the present year, 1925, the world became deeply interested in the announcement from South Africa of the discovery of the skull of a man-like ape, older and more primitive than any other similar remains previously found. The discoverer was Professor Raymond A. Dart, of the Witwatersrand University, at Johannesburg, and the find was made in an old cavern which had become completely filled with embedded sand and limestone.

Doctor Ales Hrdlicka, anthropologist of the Smithsonian Institution in Washington, regards this skull as an important link in the story of man's ancestral development. We are told that it is the



skull of a four-year-old child, which was just beginning to cut its first permanent teeth. From the nature of the rocks in which the skull was found it is believed that it represents the oldest bit of evidence yet discovered of man's vast antiquity.

This skull has been described as that of a "man-like" ape, which means that its owner was an ape which had started to evolve along the human line of ascent. The ape-like form predominated, and yet this skull reveals to the trained scientist distinctly human characteristics. We have heard much about the "missing link." However, there is not simply one missing link, but many. These popularly termed missing links are the forms intermediate between lower types and human beings and possessing characteristics of both.

In all probability the original possessor of this skull lived nearly if not quite a million years ago and looked out upon a world vastly different in appearance from ours of to-day. If the conclusions of scientists are correct, he was still a beast, but one whom God had already begun to fashion according to the divine image.

#### THE JAVA MAN

Previously to this most recent discovery, the oldest example of a human being was that of the so-called Java Man, found in 1891 by Professor Dubois, of Holland, at Trinil, Java, in rock strata whose fossil population shows that this man lived upon the earth at least a half million years ago. Sir Arthur Keith, one of the world's foremost anthropologists,

that is, a scientist whose study is the structure and functions of the human body, and particularly those of primitive men, describes this man as "a being human in stature, human in gait, human in all its parts, save its brain." He belonged to a genus that is now extinct, but that he was simply one of a numerous population like him, which inhabited certain portions of the earth at that time, there can be no doubt.

The find consisted only of a skull-cap, a thigh-bone, and two back teeth. Still, the expert in this field is able with a high degree of certainty to determine the type of being who once used these bones, and even to reconstruct his skeleton and describe his physical characteristics. We are told that the Java man possessed a low flat forehead, overhanging brows, and a brain capacity about two-thirds that of the modern skull. The thigh-bone shows that he was well adapted either to standing or running and, therefore, was in possession of the free use of his hands. It may be that he was one of the primitive men who fashioned the first rough stone implements. Belonging, as he did, to an extinct genus and species, we know that his line was only a cousin, so to speak, of the present race of men.

Associated with this find were the bones of a large number of mammals belonging to genera and species now extinct. At the time these sub-men lived and died, their haunts were overrun with the mammoth, rhinoceros, hippopotamus, a giant beaver, bison, wild cattle and wild horses. Not till many thousands of years later did men come into



*Courtesy The American Museum of Natural History.  
Reconstructions by Professor J. H. McGregor.*

#### FOUR PREHISTORIC HUMAN TYPES

From left to right: the Java Man, of strong ape-like characteristics; the Piltdown Man, showing a distinctly higher type of skull; the Neanderthal Man, with a skull of very large size but of low type; and Cro-Magnon Man, with a skull of high grade and modern in all respects.





the possession of fire, and thereby take their first step toward the real mastery of the earth.

#### THE HEIDELBERG MAN

Not for nearly a quarter of a million years after the Java Man do we find, in turning over the fossil record, the smallest fragment of a human skeleton. And then at Heidelberg, in Baden, near the Rhine, we find a jaw-bone, buried in river deposits seventy-nine feet below the surface. That is all, and yet the teeth of this jaw are distinctly human. It is not the jaw of an ape; neither is it similar to the jaw of a modern human being, for its possessor could have had no chin. Found in undisturbed deposits, whose fossil population indicates an age of possibly three hundred and fifty thousand years, we can not escape the conclusion that this geologic relic with its tell-tale teeth belonged to an individual who represents one more of the missing links in the long ancestral line, or one of its side branches, which led our forebears upward to the dawn of civilization. If it does not, in view of its place of discovery, what other explanation of its origin can be given?

Side by side with it in the same deposits were found implements of crude workmanship, and the fossil remains of the straight-tusked elephant, the Etruscan rhinoceros, the primitive horse, bison, wild cattle, the bear, lion and other forms,—either entirely extinct or not now inhabiting that portion of the earth. None of the *species* then living exists anywhere to-day.

## THE PILTDOWN MAN

Coming down a hundred thousand years, we find at Piltdown, Sussex, England, the most ancient human relic of the British Isles and the next discovered link in the ancestral line. This man is sometimes called the "Dawn Man." In the same gravel pits with these skeletal remains were found the teeth of a rhinoceros, fossil bones of the hippopotamus, and the leg-bone of a deer, together with ancient types of rough stone tools. Marks upon the leg-bone of the deer may have been cuts inflicted by a weapon in the hands of some primitive man. The geological evidence places the age of this man at from one hundred and fifty thousand years to two hundred thousand.

Although there has been considerable controversy over the exact classification of the Piltdown Man, Sir Arthur Keith makes the following statement concerning his brain:

"All the essential features of the brain of modern man are to be seen in the brain cast. There are some which must be regarded as primitive. There can be no doubt that it is built on exactly the same lines as our modern brains. A few minor alternations would make it in all respects a modern brain. . . . Although our knowledge of the human brain is limited—there are large areas to which we can assign no definite function—we may rest assured that a brain which was shaped in a mould so similar to our own was one which responded to the outside world as ours does. Piltdown man saw, heard, felt, thought, and dreamt much as we do still."

And so we must allow the Piltdown Man to stand as one more important piece of evidence in substantiation of man's slow rise through lower and more primitive types. Although he was off the main line of ascent, there can be no doubt that he was a forerunner of what one day should appear on the earth.

None of the men so far described belonged to the genus *Homo*, the type of the modern man. Their genera and species are now extinct. They were closely related to the present type of human beings, but they were not on the "line royal." The main part of the tree from which these collateral lines branched still lives, but they have become as dead limbs. Just when and where the genus *Homo* arose, we have, as yet, no knowledge. However, passing over the Rhodesian Man, whose place and significance in the ancestral line are not yet fully determined, we come now to a species which, though extinct, at last foreshadowed the arrival of the present breed of men. From the place of his discovery, he is known as the Neanderthal Man. He belonged to the genus *Homo*, and his race is well established.

#### THE NEANDERTHAL MAN

The Neanderthal Man, belonging to a race which occupied Europe for many thousands of years and which probably did not become extinct to exceed twenty-five thousand years ago, proves his existence and one-time sovereign sway, not by one skeleton merely, but by many. In 1856, in the Neanderthal

Valley in Rhenish Prussia, there was found in a little limestone cavern the perfect skeleton of a man,—in some respects the most important discovery concerning the prehistoric occupants of Continental Europe that has yet been made. The skeleton was badly mutilated by those who found it and partly lost. What remains is carefully preserved in the museum at Bonn. Since then in caves in Belgium, Croatia, France and at Gibraltar skeletons of more than a dozen other specimens of this race, including adults and children of both sexes, have been found. Concerning this long-lived race of men science speaks with no uncertain voice. It lived within reasonable hailing distance of modern times and has left us abundant evidence of its life and customs. Huxley has given us the following description of its physical characteristics:

“The anatomical characters of the skeletons bear out conclusions which are not flattering to the appearance of the owners. They were short of stature but powerfully built, with strong, curiously curved thigh bones, the lower ends of which are so fashioned that they must have walked with a bend at the knees. Their long, depressed skulls had very strong brow-ridges; their lower jaws, of brutal depth and solidity, sloped away from the teeth downwards and backwards, in consequence of the absence of that especially characteristic feature of the higher type of man, the chin prominence.”

These men lived through the Arctic cold of the glacial climate and hunted wild beasts, many of which are now extinct. They doubtless represented the most enlightened people of the earth at that



time and had taken long strides in advance of their more primitive forebears. They had acquired a fair degree of skill in making stone implements, and, most important of all, they had come into a mastery of fire, as is shown by the hearths left in their cave abodes. Their flints were beautifully fashioned in a distinctive style. We know, too, that this was a reverent race in whom had already been implanted the belief in immortality; for they buried their dead with much ceremony, providing them with ornaments and implements and an abundance of food, as though for a long journey.

Doubtless the bitter cold and extreme hardships of the last Great Ice Age were too severe for the survival of the Neanderthal Man, for he disappeared with great suddenness at about its close. That is, we find no more flints or other implements similar to those shaped by him in geological deposits of later origin than the accumulations of the last glacial drift. That this race lived and died and ruled the earth during a long period of the Rough Stone Age, no one who acquaints himself with the evidence can have the slightest doubt. The duration of its supremacy and the length of time intervening since its disappearance can be estimated with a fair degree of accuracy from the known thickness of the geological deposits made during and since its régime. Certain it is that the Neanderthal race has vanished from the earth and that men have traveled a long, long way since the days in which it flourished.

Facts like these must loom large in any attempt

to gain an adequate picture of man's vast antiquity. And have we any reason to believe that our present stage of civilization represents more than a transient phase in the divine plan of evolution which leads always to higher and higher levels?

#### THE CRO-MAGNON MEN

With the recession of the ice following the last Glacial Age and the coming of sunnier skies and milder climates, there gradually migrated into Europe, probably from South Asia or North Africa, the world's first known race of true men. They were bone of our bone and flesh of our flesh, belonging to the species sapiens, which has persisted to the present day. The race takes its name from the grotto of Cro-Magnon in France, in which a number of complete skeletons of one of the main types of these Newer Rough Stone men were found. Other skeletons of this race have been discovered in a number of caves upon the Continent. Where and how the ancestors of these cousins to the Neanderthal men arose, no one can say. But certain it is that when these gifted people came upon the scene of action and took their part as the leading actors in the great drama of human events, they had already attained to the status of modern men.

It is thought that these Cro-Magnon men were for a time contemporary with the last representatives of the Neanderthal race, but there is no evidence that the two races intermingled. And this places their emergence in the theater of European affairs at about twenty-five or thirty thousand years

ago. These successors and heirs of all that had gone before were the real cave-men of whom we so often read. Comprising at least one other race, the Grimaldi of a negroid type, these post-glacial peoples represent an enormous leap forward in the development of mankind, possibly a human "mutation" similar in character to the sudden and unaccountable evolution of a new species, occasionally observed in the animal and plant worlds. In stature the Cro-Magnon people were exceptionally large, their faces were broad, their noses prominent, and their brains astonishingly big, bigger even than those of the present inhabitants of the earth. In the making of stone implements,—knives, scrapers, gravers and similar tools,—they were superior to any race that had preceded them. Their elaborate burial customs indicate a fixed belief in life after death. They lived among and hunted numerous species of animals now extinct. The tusk of a mammoth brought down to us from that far distant past carries the rude but certain portrait of the beast himself scratched upon its surface. And it is in the art of these people, of which we have many examples, that we see emerging the soul of man and descry in the evolution of the human race the hand of an Almighty Guide. Within the caves we find expressions of their art in statues and upon the walls numerous drawings and paintings portraying animals of that time, animal types never seen by men within the span of recorded history, and scenes from their daily life. Professor Henry F. Osborn, President of the American Mu-

seum of Natural History and a foremost authority in the field of prehistoric man, writing in *The Forum*, for February, 1925, says of this gifted people:

“We have every reason to believe that the Cro-Magnon men, who dominated northern Spain, France and England between twenty-five and forty thousand years ago, could compete in the art schools with any of the animal sculptors and painters of our day, and judging from the size and form of the brain of the Cro-Magnon youth I believe that they could enter any branch of the intellectual life of to-day on equal, if not superior, terms. We know that they were mystical and superstitious and believed in magic; we know that in their art they were truthful. We know that they were reverent, because in the thousands of drawings, etchings and paintings they have left not a single irreverent one has been discovered, except in some of their representations of man. We know that they were conscientious, because their drawing has the marks of fidelity to truth, to the last detail. We know that they loved beauty, because they rapidly attained the full expression of beauty.”

And of the cave man, Professor Osborn has this to say: “The cave man bore, and still bears, an evil reputation, because few people recognize that during the long cave period there were two entirely different types of man,—one an extremely ancient lower order, suddenly succeeded in Europe by one of much higher order. Creation of this man of a higher order, known as the Cro-Magnon, with his moral, spiritual and intellectual powers is utterly incomprehensible as purely a survival of the fittest.”



And so it is. Any conception of evolution which makes it less than the expression of an infinite and all-wise purpose, slowly but irresistibly moving forward and upward throughout the ages, breaks down utterly in its attempt to account for the successive races of men, and for the sudden emergence of a race of peculiar gifts and superior genius.

#### MEN OF THE POLISHED STONE AND METAL AGES

But at length the brilliant Cro-Magnon race disappeared. Other varieties of the human family crowded into Europe, bringing with them the bow and arrow and domesticated animals. The newcomers, too, were tillers of the soil, and they replaced the rudely dressed stone implements of their predecessors with beautiful products of polished stone. The coming of these men of the Polished Stone Age dates from about twelve thousand years ago, and the evidences of their culture are legion.

These are the first people to leave a record of their craftsmanship in Denmark and Scandinavia. An investigation of the peat bogs of the Danish Peninsula has disclosed a bottom layer derived from the Scotch fir, now extinct in those regions, followed by a second layer consisting of the remains of oak trees of different varieties, since largely disappeared from Denmark, and finally by a third layer made up of fallen beeches, the most familiar tree in the peninsula at the present time. But what is more significant, the bottom layer of these bogs often contains implements of polished stone, the middle layer relics of bronze, while the

top layer exhibits specimens of workmanship wrought in iron. And that is always the story,—the oldest geological deposits preserve the most primitive examples of man's art, followed in regular order by those displaying a constantly higher degree of skill. Here is evolution of a kind,—the emergent soul of man ever expanding from smaller to larger spheres of activity. If there is no unseen Directing Agency, why this ceaseless progression? Men have come and men have gone, but, despite occasional darkness, there has always emerged a higher, a better and a nobler type of life and society. May not the creative purpose behind the races of men in this and, mayhap, other worlds manifest itself by a silent upward movement extending across the infinite reaches of time, as truly as though it spent itself in a day or a week?

The men of the polished stone implements were followed by the men of bronze and iron. Was it mere chance which led some primitive ancestor, in raking over the dying embers of his spent fire, to descry shining globules of metal? Was it only accident which taught him to alloy copper and tin to form bronze? What led him from the Age of Bronze to the Age of Iron? What put into the minds of these advancing men the first rudimentary knowledge of the simple machines? Can we see only a hit-and-miss process in this steady progress which gave to the race homes and language, industries, laws, liberties, government, literature, art, music and religion? Does it seem possible that achievements so divine could arise from the spon-

taneous, and unguided actions of human automations? Utterly unthinkable, without the idea of God, is this steady evolution, proceeding out of the misty past and leading on from brute to civilized man.

Much evidence tends to show that man sprang from several human stocks. There is no scientific basis whatever for the contention that all the races of men have descended from a single pair. Indeed, the facts point in the opposite direction. Whence came the yellow, black and brown races, numerically even more important than the white race? To assume that they have all descended from Adam, though they do belong to the same species, involves a belief in some sort of evolution. The period of time required, too, for such racial differentiation as actually exists would be far greater than any Fundamentalist would be willing to admit. In the light of modern research, this Hebrew idea of man's origin must be regarded as purely mythical.

And so the races of men multiplied and continued to advance until they subdued the earth. They have tamed the sea and conquered the air. The lightning and the boundless ether have become their obedient servants. The giant steam has long been the plaything of *Homo sapiens*, and at his magic touch the vast storehouses of natural wealth have yielded up their ages-old treasure. With his telescopes he has explored the mysteries of the stars and extended the frontiers of the universe by untold billions of miles. With his microscopes he has brought within his penetrating gaze the marvelous

perfection existing in the world of the infinitesimally small. The secrets of the atoms and the molecules have responded to his never-tiring search for truth. Inexhaustible, irrepressive energy surges in his veins. Creative evolution still governs the destiny of man, leading him on to deeper insight, larger visions, broader horizons, nobler achievements. And creative evolution is but another name for God.

Yes, again we say, man has risen,—not fallen. Behind him stretches a past of stupendous accomplishment. But it is only the beginning, for before him lies a future of immeasurable possibilities. Many men of science see in the biological tendencies of the race imminent disaster to the present state of society, but at most the eclipse can only be temporary. Emerging from its shadow, centuries hence it may be, will come a breed of men fit to carry on the work of God.



## CHAPTER V

### THE RECORD OF MAN'S DIVINITY

SOMEWHERE in the ages-old climb of man from brute to civilized human being, there was unfolded in his awakening soul the dawning consciousness of his divine origin. As naturally as the flower unfolds from the bud, or the sun, when still beneath the horizon, converts the blackness of the night into the first twilight shadows of approaching dawn, there came a time, millenniums ago, when man, standing forth under the stars and looking up at the heavens, caught the first faint glimmer of a "light that never was on land or sea." He began to feel the birth-pangs of his God-conscious soul. For the first time deep responded unto deep. In the inmost recesses of his being, was the feeble consciousness of a divine order outside of his beast-like self. And, as the centuries passed, this growing sense of kinship with something nobler and finer than himself struck its roots constantly deeper into his subconscious mind. Within his dull brain awoke the sense of beauty. A new light shone in his eyes. A feeling of separateness from the wild beasts about him took possession of his soul. The savage impulses, fostered by the long, long struggle for existence, began to soften under the influ-

ence of this new-born sense of uniqueness. Through unnumbered ages, the innate faculty of reason slowly evolved into the personality of the human spirit. Then gradually, very gradually, came thoughts of gods and grave mysterious wonderings as to the earth and the sea and the stars.

This expanding sense of power slowly and painfully manifested itself in the simple arts of the Stone Ages and in the mastery of fire. Step by step primitive man conquered his environment and at length arrived at the threshold of civilization. Along the way he had acquired the art of language and the rudiments of writing. And more significant still, the Neanderthal men, possibly fifty thousand years ago, had attained to the hope of immortality and doubtless to a belief in a Supreme Being. We know this from their elaborate burial customs and provision for the spirit's welfare, as disclosed in the explorations of the prehistoric cave dwellings of Europe. Particularly is this true of the gifted Cro-Magnon race which lived contemporaneously with the Neanderthal men during their latter centuries and succeeded to the mastery of the land.

We do not need to trace here the superstitious beliefs of primitive men in Nature spirits and the slow evolution of the idea of many gods into the majestic conception of one Supreme Being who rules not only the heavens, but the earth and all the races of men. In every cradle of civilization, these early beliefs developed into established religions. They constitute one of the most significant and unique features of the evolution of man. Implicit

in the creative urge back of all life must have been this sense of divinity, this restlessness of the human soul, this feeling of incompleteness which led men, even just emerged from savagery, to grope for God and to build altars for His worship. Incurably religious, man could not adapt himself to his environment or satisfy the longings of his soul without supplementing the strivings of his earthly existence with a belief in God and immortality.

And from the very infancy of civilization, men began to have vague wonderings as to how the earth and the heavens came into existence. Child-like, too, they invented crude stories of creation. They pictured powerful gods, enlarged human beings, as creating the heavens and the earth and all animal and plant life out of nothing within the short space of a few brief days at a comparatively recent moment of cosmic time. There was not one such story only, but many. And these stories were handed down orally for centuries before they were committed to written form. They are among the most impressive evidences of man's divinity. Only a being who is essentially divine would have framed in the very childhood of the race such noble conceptions of his origin. The wealth of learning in all the centuries which have followed has not been able to overshadow the fundamental spiritual truth which they contained.

#### THE BEGINNINGS OF THE HEBREW BIBLE

The sacred literature of the Hebrew Bible, which enshrines the highest conception of God and the

noblest evolution of religious faith to be found anywhere in the annals of men, grew like any other literature. It was subject to the same laws. It was a product of its times. It struck its roots deep into the myth and legend and tradition of the immense prehistoric background which has preceded every civilization. What we have to-day bears the same relation to the countless centuries of early toil and struggle, suffering and hardship, defeat and triumph, joy and gladness, hope and faith that the foliage of a tree bears to the branches, trunk and roots. The Bible is the world's classic record of religious experience. It is vastly more a book about men and their growing conception of God than it is a book of divine revelation. Both in what it records of known history and in what it discloses of its heritage from the immeasurable spiritual riches of preceding millenniums, the Bible portrays the evolution of the human soul as it is to be found in no other literature. In it we may trace the ever-expanding growth of any idea, such as God, man, duty, justice, sin, worship, as it broadened its scope and deepened its meaning throughout the slow upward climb of the race from infancy to maturity. In the Old Testament we may see the gradual development of those faiths and ethical ideals which came to triumph in the Christian religion.

But the origin of these sacred books was not miraculous. As Doctor J. Paterson Smyth, one of the world's foremost authorities in the field of Biblical literature, has pointed out, the orthodox belief in a divinely dictated authorship of the books



of the Old Testament was never more than an assumption. To-day, no scholar of standing holds to that view. These books are very human documents, and yet they are divine. In them we gather vivid pictures of the life from which they sprang. They reveal more or less clearly what the narratives, laws, rituals, doctrines and customs of these people meant to the generations in which they arose. The wealth and variety of its literature is unsurpassed in any other volume. It has been a treasure house of material for writers in every century of the Christian Era. Take from the English classics or from any form of Western literature the contribution of the Scriptures and there would be little left. In this perennial source of literary inspiration, we find poetry of every description,—lyric, didactic, dramatic; passionate songs of war, affectionate love-songs, sublime descriptions of Nature, devout hymns of worship. And there we find, too, biographies, collections of laws, legal documents, chronologies, the crystallized wisdom of many ages, religious rituals and ceremonials, romances, parables, legends and traditions of the past, the dream literature of apocalyptic visions, letters, historical records, and the inspired utterances of prophet and reformer. Like any other literature, some of the writings in this unique collection are of little merit. They bear the impress of their very human origin. But, all in all, these productions of the Hebrew race take rank among the noblest literary and religious masterpieces of all time. They were the outcome of many minds in many times, from the prophet,

sage and seer of the dim shadowy ages of prehistoric men to the apostles of Christian faith in the beginnings of our own era. In speaking of the earlier historical books, Matthew Arnold said: "To that collection many an old book had given up its treasures, and then itself vanished forever. Many voices were blended there—unknown voices, speaking out of the early dawn."

And yet these crystallizations of the soul's struggle for expression and a realization of its noblest ideals are more than human. They are as much a part of the divine progress of all creation as is the life cycle of a solar system or the pageant of organic evolution. They have sounded the greatest depths and touched the loftiest summits of human experience that the world has ever known. They are the noblest examples of the "life of God in the soul of man." But they are not unique. Wherever men have climbed upward and struggled and suffered and triumphed, there we see a revelation of the spark of divinity which lights the soul of every human being. Every great religion is an expression of God. He is the Creator of every race, and, although the moral and spiritual qualities of the soul have flowered most conspicuously in the Hebrew branch of the human family, this religion is not the only one which reveals the guiding hand of an Infinite Purpose. Religions and this unfolding of the divine in man were old long before the Hebrew people appeared at the threshold of civilization. Just as the fossil record of the rocks reveals to us the story of the earth's past organic evolution,

so does the Hebrew Bible preserve the world's most notable example of spiritual evolution. And this Bible is both human and divine.

The Bible is not infallible, nor is it free from error. In the earlier portions, its representations of God are occasionally childish and sometimes morally degrading. Some of its statements are absurd, and they are frequently subject to exaggeration. The crudities of its scientific teaching are such as we should expect from an infant race living in an age of ignorance and superstition. The supposition that they were divinely revealed by God to the Old Testament writers convicts the Almighty of astounding ignorance of the product of His own handiwork. Surely, had the Creator of the heavens spoken directly to the authors of the Story of Creation, He would not have given to them ideas so at variance with the revelations of modern astronomy. But the Bible, of course, is not a textbook of science. The poetry of Genesis does not give exact information regarding the origin of the earth, the heavenly hosts, and the creation of life. As literal description, these crude notions of the universe are absurd, to be sure. They represent only the passing fancies of a childlike people in the infancy of the race. That they should ever have been placed alongside the discoveries of modern science, as being of equal and indeed superior validity, is one of the most astounding marvels of history. The prevalence of such ideas among the docile peoples of the Middle Ages and the imaginative theologians of the early church is quite under-

standable. But utterly unworthy of the immense benefits flowing from scientific research are those unenlightened would-be leaders of their fellow-men who would pin the spiritual progress of mankind to-day to a literal belief in the myths and legends of prehistoric times,—and that in the face of the most astounding array of scientific evidence to the contrary that ever confronted the intelligence of men. As well believe in giants, fairies, demons and witches. Both beliefs go back to the dim shadows of man's evolutionary past. But it is a curious fact that those who deny most strenuously this ascent of man from a lowly origin cling most tenaciously to childish and superstitious beliefs springing from that very past.

Still those scientific crudities, when viewed in their proper setting, in no way mar the transcendent beauty of the Story of Creation or impair the supreme spiritual truth which it unfolds. This matchless poetic conception of the origin of things crystallized for all time a belief in one God, a Supreme Being, who is the immanent source of all creation. That the facts of scientific discovery should indicate that our solar system had its origin in a nebula and that organic life, taking its beginnings in very simple forms, slowly evolved through unnumbered eons, until the animal line of ascent culminated in man, “a little lower than the angels, crowned with glory and honor,” neither detracts from the majesty of God nor challenges the uniqueness and nobility of man. No more striking evidence of man's divinity can be found than this sublime



conception of creation. It marks the first great turning-point in the spiritual evolution of the race. Like a beacon light from man's primitive cradle, it shines across the centuries, even to-day, with undiminished brightness. Why should men ever have cast a reflection upon the overshadowing spiritual truth of this noble conception of God and the Divine Immanence by insisting upon its literal accuracy as a description of creation? As actual method, this mythical story is grotesque; as a symbol of the fundamental fact of the universe, it is sublime.

#### THE LEGENDS OF GENESIS

Yes, there are legends in Genesis. But legends are not lies. A legend is a particular form of poetry. And why should not the lofty spirit of the Old Testament, which has found expression in so many varieties of poetry also make use of legend? It is but natural that such a highly imaginative people as the Israelitish should have made poetic narrative the vehicle of its religious thought. In these oral transmissions of popular traditions, the history of every primitive people begins. And it must not be forgotten that prehistoric memories may be preserved in these legendary tales of family and tribal life. Starting with a nucleus of historic fact or some great spiritual truth, these incidents of primitive life, transmitted for centuries by word of mouth, worked over by the imagination, enlarged upon and altered in many details, become one of the most precious legacies from the unrecorded past. They often deal with the intimate scenes of

family life,—not with important historic events. The legends of Genesis have to do largely with the family of Abraham, which gave rise to the patriarchs of Israel. In them popular tradition has preserved much that is trivial and unimportant historically, but of wonderful interest as character sketches of the people, such as anecdotes of country life, tales of springs and watering-troughs, revelations of jealousy, deception, piety and magnanimity, incidents of war and stories of personal prowess.

Little did those simple folk in those far-off days of family and tribal supremacy realize that they were making the beginnings of a sacred literature. Yet, those poetic legends, rude ballads and fierce war songs, told and sung for centuries by bard and story-teller about the fireside and the well, became the nucleus around which our Bible grew. To this ever-increasing stream of oral tradition were added simple codes of justice, bits of history, and stories related in lonely pastures “when shepherds watched their flocks by night.” The practised story-tellers at feasts and tribal gatherings took the place of modern books. We can picture groups, reverent with worship or gay with merry-making, listening to these patriarchal legends, singing songs of war and love, and often gaining from prophet and seer truer and larger conceptions of their great God, Jehovah. Repeated over and over from generation to generation at wayside watering-place and public sanctuary, these stories from the past, often retaining but a fragment of the original setting, became part and parcel of the racial legacy.

We must freely recognize, however, that centuries of oral transmission among a childlike and imaginative people would tend to add much which is pure invention. Heroes are idealized. Stories are enlarged and altered. And yet we know that we are dealing with the traditions of real men and women, who lived and died and loved and fought and met both victory and defeat. True, their simple faith enabled them to believe many things which we know to be utterly incredible. But credulity was a chief characteristic of those early times of ignorance and superstition. And this very ear-mark of their age gives an added charm to these simple beginnings of Hebrew poetry. Most important of all, we trace in them the noblest conception of a divine order of the universe to be found in any early literature.

And so, preceding the Bible, as we have it to-day, lay an immense background of unexampled literary riches. It struck its roots deep into the prehistoric sources of its own and other peoples'. Most of this ancient lore is lost. But fortunately the excavations of archeologists have enabled scholars to trace the very considerable contributions of other literatures to our sacred books. Particularly important was the influence of the Chaldæo-Babylonian and Egyptian civilizations. Many of these precious treasures of ancient thought are preserved for us in the legends of Genesis. And, contrary to the earlier belief, Genesis was by no means the first of the sacred books to be compiled. In completed form, the Pentateuch, of which it is a part, dates

from about 400 B. C., many centuries after other portions of the Old Testament had taken shape. With this knowledge, obtained by applying to the Scriptures the same methods of scientific investigation that are employed in all other branches of historical research, much becomes clear which was before a mist. We now know that the legends of the Creation and the Deluge were not written until after the Hebrew people had come under the tutelage of their Chaldean neighbors in the valley of the Tigris and the Euphrates. That the rich legacy from the religious literature of this earlier civilization had a profound influence in shaping these legends, there is not a shadow of doubt. That they did not originate with the Hebrew people is no longer open to question. That they were a direct revelation from the Almighty of actual events, now, has no more credibility than the belief in Santa Claus. Whoever still clings to the literal interpretation of these mythical stories, has not taken the trouble to inform himself of facts which for many years have been open to the knowledge of all.

But let us see what these investigations of the archeologists have disclosed. Just as the geologist investigates the fossil record of the rocks, so does the archeologist uncover the debris of ancient civilizations. He permits us again to walk the streets of those old cities, to feel the heart-beats of their peoples, and in imagination to picture the humanity that once struggled and thought and dreamed and suffered there. He enables us to catch glimpses of the life of those peoples,—their customs, laws, domestic habits and religious faiths.



In 1851 Major Rawlinson published the first translation of the Assyrian inscriptions, and in so doing began the uncovering of a civilization which antedates that of the Hebrew people by many centuries. It was already old in the year 4004 B. C., the date assigned by the sacred chronology for the creation of the heavens and the earth. And two thousand years before the legendary date of Abraham's migration from Ur of the Chaldees, this Chaldean civilization had achieved much in art, science and literature. Many eminent scholars have contributed to our knowledge of these treasures of antiquity, chief among whom was George Smith, who in 1872 found in the ancient library of Asshurbanipal the first of the tablets giving an exceedingly close parallel of the story of the deluge. Soon after, he discovered in these ancient ruins more of the deluge tablets and all those giving the Story of Creation. That these sacred myths and legends were already old when the Hebrew writers incorporated them into their Bible is no longer a matter of speculation. Their roots penetrate into the legendary past, not only of the ancient civilizations of the Tigris and the Euphrates, but of other early peoples. Few races in their infancy have failed to wonder about the origin of the stars and the earth and man. Of course, no man was present at the creation of the universe, and no human tradition extends back to the origin of the race. Still the divine urge of creative evolution has impelled primitive peoples everywhere to seek an explanation of the whence and whither of life and of the

universe of which they are a part. To their imaginative minds and simple faiths, all miraculously sprang into existence at some definite and recent moment of past time, in obedience to divine fiat.

But what do these tablets of ancient Assyria reveal? As is to be expected, there are both striking similarity and divergence between the accounts unearthed by the spade of the archeologist and those found in the worked over legends of Genesis, but the essential ideas are the same in both. According to the story told by the tablets, out of a watery chaos, a divine power brings forth the earth and its inhabitants. He creates first the sea animals and then those of the land, the latter being classified into three groups, practically identical with those of the Scriptural account. At various stages of the process, the Chaldean divinity pronounces the work "beautiful," just as the Hebrew Creator pronounces it "good." In the Chaldean legend, we find the solid firmament of heaven, and in both accounts light is created first and afterward the heavenly bodies are placed "for signs and for seasons." Very significant is it, too, that these Assyrian tablets contain two stories of creation, wonderfully similar to the two Hebrew narratives found in the first and second chapters of Genesis. We discover in these remarkable revelations of primitive thought evidence of the Chaldean belief in the creation of woman out of man, in the Garden of Eden and its mystical tree, and in the fall of man through sin from a state of innocence. Here, too, we find the institution of the Sabbath



*From "The Bible in the Making," by J. Paterson Smyth.  
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#### BOOKS WRITTEN ON BRICKS

One of the tablets giving the Chaldean account of the Deluge and the Story of Creation. Excavated in the early 'seventies, now in the British Museum.





and even its name, the mythical Tower of Babel, and much else that appears in the Pentateuch.

But it is in the legends of the deluge that the resemblance is most apparent. In the Assyrian narrative, Hasisadra is apprised of the coming flood and is bidden by the gods to build a ship one hundred twenty cubits in height and of equal breadth. In it he took refuge with his slaves and family and stores of food. In accordance with the divine summons, he also preserved cattle and beasts of the earth and fowl of the air. In striking similarity to the Biblical account, the ship was pitched within and without. Hasisadra entered and closed the door and the flood came. So terrible was the storm that the gods in heaven were frightened and wept. The flood lasted for six days, during which the occupants of the ship watched the corpses floating by. On the seventh day, the waters began to subside, and after seven days more the ship came to rest on the mountains of Nizir. The poem narrates the sending forth of a dove, a swallow and a raven and the offering of sacrifice, concerning which it relates that "The gods smelt the savor," even as the account in Genesis contains the remarkably similar statement "And Jehovah smelled the sweet savor." And finally, we are told how the Goddess Istar lighted up the rainbow in the heavens.

Regarding such amazing discoveries, there can be but one verdict, particularly so when we know that the Genesis narratives were not compiled until after the Babylonian bondage of the Hebrew

people. That these stories are poetic narratives of what infant races imagined to be true, there is no longer any doubt. And now, written on tablets of stone, we have the authentic source of the Hebrew versions. The numerous accounts of a flood, found among the traditions of the Greeks, the Chinese and the American Indians, as well as among those of other early peoples, leave little doubt that some such catastrophe once engulfed a considerable portion of the earth since the beginning of its inhabitation by the human family.

But let us not fail to note that these old legends from the prehistoric cradles of primitive civilizations were transfigured by the divine touch of Hebrew thought. They were refined and purified in the crucible of living truth. From the polytheism of early thinking, we pass in the Genesis narratives to the transcendent conception of one God. It is like going from the humid bacteria-laden atmosphere of the lowlands to the invigorating air of mountain summits. And in the tremendous contrast between these two undeniably related accounts of the origin of the universe and its life, we see the most notable example of the spiritual evolution of the race to be found anywhere in the sacred literature of the world. It constitutes an undoubted record of man's divinity, as ineffaceable as the fossil imprints of early geologic life in the solid crust of the earth.

With these overshadowing facts of spiritual values in the background, we can pass over the serious discrepancies in the two accounts of crea-

tion, their crude notions concerning the person of God, and the unscientific features of their imaginary universe. What God said or thought in the councils of heaven, we know to be pure invention. We know that the "firmament of heaven" is an optical illusion; that the sun and stars did not come into existence after plants; that the rivers of the earth do not come chiefly from four principal streams; that the Tigris and the Euphrates have not a common source; that the Dead Sea antedates historical times; that only a small fraction of the hundreds of thousands of species of animals could have been got into the ark; that God did not walk in the Garden of Eden "in the cool of the day"; that He did not make for Adam and Eve clothes from skins; that there is no evidence that the nations of the earth sprang from a single family; that it is highly improbable that Cain founded a city; that serpents do not speak; that there is no tree whose fruit confers knowledge or immortality; and that God does not speak with a human voice. All this and much more we now know to have been but literary incidents in the poetic narratives of a highly imaginative and exceptionally religious race. Ever to have identified them with actual events is one of the most grotesque errors of history. To persist in doing so in this twentieth century of enlightenment is a crime against truth. To make belief in the literal accuracy of these outgrown legends essential to spiritual health is pathetic.

Although the details can not be given here, Egyptologists, by the application of the same

methods of scientific research, have shown the large contribution made by the lore of the ancient Nile to the making of our Bible. But these discoveries, far from belittling the importance of our sacred books, enhance their value. They simply demonstrate that sacred literature, instead of being a sudden revelation, is the product of a slow evolution from a remote past. It is the crystallization of the spiritual wealth of the ages. Its sources are multitudinous and its background the rich and varied religious experiences of mankind. But that this literature is unique in its origin, that it is free from error and does not bear the impress of human frailty, is a belief which the revelations of science and archeology have long since shattered.

Still we must recognize in the growth of every such literature the unfolding of the divinity in man and throughout the whole course of its development the Divine Immanence of an Infinite Guide. As Doctor John A. Rice has said, in our Bible we see "the life of God flowing through the soul of the Hebrew people." Their idea of God is now material, now spiritual, but purifies itself as time goes on and continually rises to larger cycles and higher levels. When we silhouette the religious experiences of the race against the background of the ages, it is not difficult to discern the unfoldment of a divine progress, even as we do in the evolution of solar systems and organic life.

#### THE BIBLE AND INSPIRATION

What do we mean when we think of the inspira-



tion of the Scriptures, particularly the inspiration of the Old Testament? Certainly not verbal dictation. No scholar of standing to-day believes that God ever directly revealed any portion of our sacred books. Had He done so, they would not contain so much that is false. The Scriptures would not then give, as they often do, a picture of a God of passion, jealousy, remorse, cruelty and caprice. They would not mirror so perfectly the various stages in the spiritual evolution of the Hebrew people. The God of the universe would never have revealed Himself as a tribal deity. Had not the Hebrew people in their youth attributed to God their own ethical standards, we should not read that Jehovah commanded the extermination of the Amalekites,—“both man and woman, infant and suckling.” The God of humanity and compassion, whom we worship to-day, would not have administered through His prophet Samuel a rebuke to Saul because he had spared Agag. A God of direct revelation would not have represented Himself as attempting to kill a man, as an exhibition of pure malice, at a wayside lodging-house. Had God dictated the account of creation, what mysteries He might have solved for us mortals! We should never have had to speculate about the Nebular Hypothesis, the actual factors in creative evolution, and the secrets of the atoms and the molecules. The world would not have had to wait for Galileo to reveal the structure of the heavens. Had Scripture been as inerrant as early theologians, and some to-day, imagined, what mighty controversies this poor earth would have been

spared! No, the evidences of human handiwork are written large from cover to cover of this old Book. In what then does its inspiration consist?

Professor Albert C. Knudson, one of the most inspiring teachers under whom it has been my privilege to sit, says in his *The Religious Teaching of the Old Testament*: "In the case, then, of 'revealed' truth what we should expect is that certain impulses from the Divine Spirit would impinge upon the human mind, and that these would then be worked up in harmony with the mind's own laws and translated into the concrete messages of the prophets. In this process much that is distinctively human would necessarily intermingle with the divine, and there would be in the process itself nothing essentially different from that observed in the composition of other books. The Bible, we should consequently expect, would be a book or collection of books to be studied just as other books are. It would not be inerrant. Its origin and development would be subject to the same laws as those operative in the literature of any people."\*

And such we instinctively feel must be the case. Inspiration is an all-powerful, inward persuasion that one is called upon to do a certain thing. Thus do we explain the impassioned utterances of those fiery prophets of ancient Israel, veritable incarnations of moral power, who scourged the people for their wickedness with predictions of impending calamity and became the greatest apostles of righteousness the world has ever seen. They were

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mighty preachers, great moral reformers, who read the signs of their times and sought to save their people from the destruction which lives of luxury, ease and social injustice on the part of the richer classes so often invited. In this sense Abraham Lincoln was inspired when he penned the Emancipation Proclamation, the Second Inaugural, and the Gettysburg Address. Lincoln was as truly a prophet of God as were those of old. And so were Savonarola and the poet Tennyson and Galileo and Newton and a host of others. Inspiration has never ceased. Every truly great work of art, literature, science, or statesmanship is inspired of God. Why should He ever have ceased to reveal Himself in the hearts and minds of men? The creative urge which He implanted in the soul of man will forever manifest itself in works of inspiration.

But as to the inspiration of the Old Testament, let me quote again from Professor Knudson: "Old Testament religion is the only national religion that ever survived the nation's downfall. When other nations fell they threw their gods to the moles and the bats, thinking they had been overcome by superior deities. And this would have happened in Israel had it not been for the prophets, who during the period of the nation's decline elevated Yahweh (Jehovah) to the throne of universal sovereignty, and declared that the destroyers of the nation were simply the instruments of His wrath. This is a most remarkable fact without parallel in the religious history of mankind. Had monotheism originated in Assyria or Egypt, it would not have been so strange,

for these empires were virtually world-powers. But that it should have originated among a small people like the Hebrews, and have been first proclaimed among them at the very time that they were on the road to political ruin, is a fact so contrary to the normal operations of the human mind that we can not but see in it a special manifestation of the presence of the Spirit of God. There is no better proof of the inspiration of the Old Testament than just this fact."

So we may say that inspiration, shorn of its supernatural implications, whether it be found in the Scriptures or elsewhere, is an extraordinary manifestation of the Infinite in the lives and works of men. And inspiration is a hallmark of man's divinity, for only that which is divine can become inspired.

#### THE MESSAGE OF SCIENCE

No more convincing evidence of man's divinity can be found than that mirrored in the progressive revelations of science. That they should not have been welcomed as a tremendous aid to the rediscovery and reinterpretation of God and the Scriptures, which must be made in every generation, is a tragic blunder of the old theology. The application of scientific methods to Biblical research has enabled men to catch the spirit of the times in which the Scriptures were written and to understand in constantly increasing measure that inextricably tangled background of religious experiences out of which they grew. And that is all that "Higher



Criticism'' means. It is simply the use of intelligence in the study of the Book of Books. It goes back of the documents and determines the chronological order of the various books, their sources, and the social, political and religious atmosphere in which they took shape. It breaks down traditionalism and prevents the fossilization of religious thought. It recognizes that religion is a living, growing thing, a constantly evolving product of human experience, unfettered by the dead hand of the past, vibrant with that creative impulse of the Divine Immanence, which never ceases to manifest in every form of activity, material or spiritual. Science simply pleads for that broad and tolerant interpretation of Scripture and that zeal for truth which have led to such marvelous advances in every other field of human knowledge. To the understanding of the religious experiences of mankind, it would bring an open mind and the spirit of inquiry.

Nothing else has so immeasurably enlarged our conception of God and His stupendous universe as have the discoveries of science. The triumphs of astronomy, medicine and physical science are as much a revelation of the Divine Immanence in the soul of man as are the spiritual truths of sacred literature. Both link man with the Infinite and forever establish the fact of his divinity.

## CHAPTER VI

### GOD AND IMMORTALITY

ONE approaches the idea of God with hesitation. It is the biggest idea that ever confronted the intelligence of men. It is an idea too great to be grasped in more than a small fraction of its infinite significance. In its overwhelming vastness, it bewilders thought and defies analysis. Enfolded within it lie the hidden life of the universe and the interpretation of its meaning. The idea of God has grown with the ages. The crude elemental God of the savage passed into the tribal Deity, swayed by human passions and actuated by human motives, only to be succeeded by the prophetic conception of a world God of absolute justice and perfect righteousness, and finally to be supplanted by the universal Father of the Christian religion and the Divine Immanence of scientific philosophy. This ever-changing idea of God has needed reinterpretation in each successive period of intellectual development. It has grown with advancing knowledge and risen with the evolution of the race to constantly higher levels and nobler ideals. The savage imagined the presence of spirits in fire and water, wind and storm, the lightning and the thunder; the patriarchal tribes worshiped a re-

vengeful God of wrath, remorse and repentance; the prophets portrayed an austere God of moral law whose sovereign sway extended to all men; some of the later Psalmists had caught a vision of the confident assurance and radiant joy of the God of New Testament hopes; in Christ, we see the God-idea flower into the conception of the All-Father of infinite compassion, mercy and love; while science has added the thought of a God whose life ensouls the universe and whose ways of action are the immutable laws of cosmic evolution.

These descriptions, however, by no means exhaust the multitudinous ways in which the idea of God has found expression. Herbert Spencer, materially-minded devotee of science, thought of God as a fount of perpetual energy. He summarized his idea in the following oft-quoted statement: "Amid all the mysteries by which we are surrounded, nothing is more certain than that we are ever in the presence of an Infinite and Eternal Energy from which all things proceed." To the poet Wordsworth, God was "a presence that disturbs me with the joy of elevated thoughts; a sense sublime of something far more deeply interfused, whose dwelling is the light of setting suns, and the round ocean and the living air, and the blue sky, and in the mind of man; a motion and a spirit that impels all thinking things, all objects of all thought, and rolls through all things." To Emerson, Christian philosopher, God seemed to be a sort of "Over-Soul," "the wise silence, the universal beauty, the Eternal One." Carlyle, prophet of pessimism, sar-

castically characterized the Deity of the Church as "an absentee God, sitting idle ever since the first Sabbath, at the outside of His universe, and 'seeing it go.' " To the mathematical mind of Laplace, "the hypothesis of God" was wholly unnecessary. Immanuel Kant, one of the greatest thinkers of any time, said: "The conception of God involves not merely a blindly operating Nature as the eternal root of things, but a Supreme Being that shall be the author of all things by free and understanding action; and it is this conception which alone has any interest for us." John Fiske, eminent American historian, described the Ruler of all things as "the infinite and eternal Power that is manifested in every pulsation of the universe." And so we might continue, but let us turn to the evolution of the idea of God, as it has taken shape throughout the ages of man on earth.

Primitive man found himself in the midst of a natural environment, often cruel and ruthless, as well as sometimes genial and kind. The sense of dependence upon this awfulness of Nature, which he did not understand, struck its roots deep into his soul. Why should the tempest sweep away his rude home, or the summer showers water the earth and make it bring forth food, or the sun govern the coming of day and night? The only cause of things, of which he had any experience, lay in his own sense of will-power. He knew that he himself by his own action could bring things to pass. And so as naturally as the dawn, there was born in his mind the idea that the great physical forces with which he



found himself surrounded were animated by intelligent beings, whom he must combat or whose favor he must win. Thus many races of savages became Nature-worshippers. It has always been characteristic of men to worship that which they could not understand. From earliest times, among savage tribes the sun has been personified as an archer, the clouds have been pictured as immense birds, and the tempest as a voracious dragon.

And then again, another "superstition" has played a large part in the development of man's incurably religious nature. No race of men has ever been found that did not believe in ghosts. Every individual is supposed to have a spirit, a wraith, a sort of intangible duplication of himself, which during sleep wanders in strange lands and after death continues to exist. In sleep this ghost converses with dead companions, or joins in the hunt and chase. And not only this but beasts and even inanimate objects were imagined also to possess ghosts, which fact accounts for many of the elaborate burial customs of primitive men. With such a faith, we may easily see how naturally the savage passed to a belief in the god of the lightning, the wind, or the fire. Growing directly out of such superstitions, too, was the system of ancestor worship, which has been characteristic of every race of primitive men. The chieftain at death did not cease to watch over the fortunes of his tribe. His continued favor must at all times be won with appropriate ceremonies, or defeat and calamity would be the portion of his unfaithful followers. As a

result of these two marked tendencies, there grew up in the primeval world a curious mixture of ancestor worship and Nature worship.

Accordingly, in those early times, we find a belief in many gods. But it is one of the chief evidences of man's divinity that in the course of centuries he evolved to the lofty conception of a single Supreme Being. When savage tribes were beaten in battle, they threw their gods to the "moles and the bats" and adopted those of the conqueror. Thus, there grew the idea of a national deity, who, while at first only one among other gods, was the greatest of all. But, as the world knows, the crowning example of the supremacy of one god over others occurred in the spiritual evolution of the Hebrew race. Unprecedented as it was, in the midst of national calamity, the Hebrew prophets, catching a larger vision of the eternal truth than had ever before been revealed to mortal men, elevated Jehovah to the throne of universal sovereignty. Up to this time, the existence of other gods had been freely recognized, even among the leaders of the "Chosen People." But the intense feeling of nationality prevailing among the people of this gifted race, undismayed by defeat after defeat, finally triumphed in the development of a religious movement which was to become the foundation-stone of Christian civilization. When the work of Jesus and St. Paul had made Jehovah the Immanent Guide of the universe and the Father of all mankind, there emerged for the first time in the evolution of the race the transcendent conception of a Supreme Ruler, shorn of every limitation.

## TWO OPPOSING IDEAS OF GOD

From the days of the early Greeks to the present moment, there have been two opposing ideas of God. Nature worship predominated among the highly imaginative Greek people. Out of this tendency to deify the physical forces of Nature gradually grew the idea of a single Supreme Being whose life is the all-sustaining power of the universe and whose ways of action are the fixed laws of physical phenomena, or happenings. All Nature, all life were made ceaselessly dependent for their existence upon this ever-present and immanent source of Divine Power. Theirs was the idea of an "indwelling Deity." Out of the past grew the future. Implicit in this fundamental source of Divine Energy was the evolution of all created things. God was not a being apart from the universe, but in it every moment and at every point of manifestation. Like so many other speculative notions of this brilliant race of thinkers, their idea of God, as we shall see, was strikingly similar to that of modern science.

But over against this conception and growing out of the primitive form of ancestor worship, there developed the idea of an absentee Ruler, whose relation to the universe is precisely similar to that of a monarch to his kingdom. According to this view, the physical happenings of Nature are not the ceaseless manifestations of an indwelling Deity, but rather the forced effects of an outside power, which operates the universe, much as an engineer controls his locomotive and train. And this outside

power is thought of as a man-like being in the crudest sense. It is simply the ghost idea carried backward and magnified into a majestic Monarch, who created a universe of blind mechanical forces and set it going, after the fashion of a jeweler who makes a clock and winds it up. Only occasionally does this lifeless machine need attention from its Divine Creator, who sits enthroned far off from His domain, attended by hierarchies of celestial beings. This very human Deity was represented as subject to passion and caprice, as pleased or angry, as repenting of His own acts, as appeased by praise and quick to wreak vengeance upon His creatures for blasphemous remarks or iniquitous actions. His direct action in the physical universe was through the suspension of the natural laws governing the operation of his inert machine. But, from the standpoint of its construction, this was perfectly logical, for the whole mechanism might be altered at a moment's notice to suit the capricious will of an autocratic Ruler.

This latter conception portrays the God of the early church. It has profoundly influenced religious thinking for nearly two thousand years and persists even at the present day. St. Augustine with his doctrine of original sin, which pictured a crude man-like God cut off from all relationship with humanity, save through the mediation of the church, fastened this wholly imaginative and un-Christ-like view upon the thinking of mankind for many centuries beyond his time, and it even to-day shackles the spiritual growth of a host of



earnest Christians. So firmly did this grotesque notion of the Deity grip the minds of men that in the sculptures, mosaics and stained glass of cathedrals, as well as in the illustrations of pictured Bibles, God is represented as busied with the actual work of creation. In one instance, He is shown, needle in hand, actually sewing together skins of animals to make clothes for Adam and Eve. Above the tomb of Linnæus, the great Swedish naturalist of the eighteenth century, in the cathedral of Upsala, may be seen the legend of creation carved in stone. In a succession of scenes, God, in the form of a human being, is represented as performing by His own physical exertion the various acts of creation, crowning them by the making of man out of a hillock of earth and woman from man's side. To hosts of people, all through the Middle Ages and after, the universe was literally "the work of His fingers." Shorn of their legendary origin, there is not a particle of evidence to justify such anthropomorphic, that is man-like, conceptions of God. They were born in the prolific imaginations of the church fathers, who mistook the poetry of Genesis for literal fact. That hosts of people in this scientific age, with an overwhelming abundance of evidence to the contrary, should still cling to such relics of a superstitious past, is one of the outstanding marvels of all time.

This false idea, too, inbred in the religious thinking of men for so many centuries, became one of the chief obstacles to the acceptance by the church of the spiritual implications of the discov-

eries of science. Just as the reign of law extended its domain, it was thought that God's sphere of influence vanished. The idea of a Majestic Monarch, ruling the universe from the outside, had gained too strong a hold upon the minds of men. Had the conception of an indwelling Deity been accepted by the early Church, the world would have been spared those tremendous conflicts between science and religion which mar the pages of theological history and we should not have had to wait long centuries for those scientific discoveries which have meant so much to the progress of mankind, both spiritual and material.

#### THE GOD OF SCIENCE

The God of science, according to the modern view, has also been the product of an evolution of thought. Even as early as the time of Socrates, men were fond of speculating on the idea of a Great Architect, who designed the universe and all its parts in accordance with a Divine Plan and then so nicely adjusted and correlated the whole mechanism in its manifold workings that the outcome was a benevolent order of creation. Each product of organic life and each physical fact of Nature came to be regarded as distinct ideas of an Intelligent Being, who thought the universe into existence. The inclination of the earth's axis to the plane of its orbit at just the right angle to produce the change of seasons and the hundreds of beautiful adaptations of organisms to their respective environments, as well as the numerous other pro-

visions in the economy of Nature for the welfare of living things, seemed to prove a fundamental purpose back of creation. Even down to the middle of the last century this view held sway in scientific circles. Beyond question, too, there is a large measure of truth in this conception, for unmistakably the earth does seem in its ordering to disclose purpose.

But the belief that this view revealed more than a glimpse of the whole truth was rudely disturbed by the publication of Darwin's *Origin of Species* and the disclosure of what seemed a ruthless struggle for existence. A little reflection showed that Nature is not always benevolent in her ways. There are numerous examples of extreme cruelty and the ill-adaptation of organisms to their environment. In the light of the stern realities of existence, it seemed impossible that God could be both benevolent and omnipotent. Gradually the idea arose that in some way His power must be limited. Within those limits, He had created the best possible world. Still in the ideas of a supreme intelligence, a divine purpose, and a large measure of benevolence, this early God of scientific thinking represented a distinct advance over the crude conception of St. Augustine and his followers.

During the latter half of the nineteenth century, the work of hundreds of naturalists unfolded for the contemplation of men the sublime pageant of organic evolution, and with it came the revolutionizing idea that the universe has grown like an organism. The notion of a machine-like world, made

and operated from without, receded into the background of scientific thinking. The indwelling Deity of the Greek philosophers came to the fore once more. A Divine Immanence was believed to ensoul the universe. Creation began to be thought of as a ceaseless process, rather than a product. It was no longer a lifeless static thing. God, who had been banished by Christian thinking to the outskirts of the universe, where He sat in solitary grandeur, gloomily contemplating the dissolution of His power as the encroachments of natural law constantly pushed Him farther and farther into the background, was reinstated as the Immanent and Eternal Guide of all created things. The idea of an absentee God was shattered. The universe became the ceaseless expression of His thought, natural laws His ways of action, and religion His life in the souls of men. The uniformity of Nature became as axiomatic as the mathematical truths of reason. Divine caprice became a thing of the imaginative past. Miracle and the consequent arbitrary interference with natural law became unthinkable violations of the divine nature. The world became a living, throbbing organism, whose growth is as natural as that of the springtime violet. Implicit in this life informing all creation is the personality of the human spirit, which differs from Divine Personality only in degree. Up to the present point of evolution, this personality is the flower of creation, and what infinite possibilities it may yet unfold, only the future ages can disclose.

It is true, the first effect of this new scientific



background was a wave of skepticism. For a time it seemed to many men of science that physical forces and natural laws eliminated all necessity for God. While probably relatively few became confirmed atheists, many followed Huxley into the camp of agnosticism, neither giving nor withholding assent to belief in a Supreme Being. But gradually the utter inadequacy of blind chance and unintelligent forces to account for a universe of perfect law and order asserted itself, and the pendulum began to swing in the opposite direction. Critical thought developed the fundamental truth that cosmic laws imply a Divine Lawgiver. God became as necessary to science as He had been to theology.

Many discoveries of science have tended to confirm this belief in an Immanent Being, whose life is the soul of the universe. The law of gravitation has extended its sway to the distant stars. The spectroscope has disclosed in nebulae and giant suns the same elements that exist in the earth. Our kinship has been established with the countless other members of the "heavenly hosts." The boundless ether seems to bind the universe in cosmic unity. Our knowledge of the atoms, with their miniature solar systems of revolving electrons moving with the same marvelous precision as obtains in the celestial spaces, bespeaks a reign of perfect law, extending from the infinitesimally small to the infinitely great. The resolution of matter into vibrating points of energy comes very close to establishing a fundamental relationship be-

tween the material and the spiritual. Every fiber of the universe appears to be aquiver with some subtle form of energy, or life. The law of evolution, extending as we believe from the formless chaos of the fire mist through nebulae and solar systems to the smallest of living organisms, links the universe in one vast system of interrelated parts.

Blind chance can not account for the creation and maintenance of such a universe. No Ruler external to the system could coordinate its infinitely numerous processes in perfect harmony and unceasingly supply its sustaining energy. Only a God in whose life the universe exists and moves and has its being is equal to so stupendous a task. And such a conception is the only one that can satisfy the demands of our human understanding. Yet God must be more than this. He must not only be the eternal source and all-sustaining creative power of the physical universe, but He must supply with His spiritual presence our moral, religious and esthetic ideals. All the nobility of character, all the fine qualities of the human spirit, and all the wealth of love which have flowered in the evolution of the soul of man must have had their origin in Him. The very fact that we possess these God-like qualities of heart and mind proves that they are also attributes in infinitely larger degree of Him in whose image we are created. A fundamental teaching of science asserts that there can be no effect without an adequate cause. The personality of man must, then, find its counterpart in that larger Personality which brought it into being.

As Sir Oliver Lodge says, "I will not believe that it is given to man to have thoughts, nobler or loftier, than the real truth of things." A stream can rise no higher than its source. Implicit within the God of life must be all the riches of human experience. Otherwise, they never could have found expression. That is the clear teaching of science. The God of science is more than the "Infinite and Eternal Energy" of Herbert Spencer. Not only must we find in Him the origin of nebulae and solar systems, physical forces and natural laws, but also in overflowing measure the divinity of the human spirit.

And science would be false to its own basic principles and to its own interpretation of natural phenomena, did it deny the existence of God altogether. The crass materialism which engulfed the scientific thinking of a half-century ago has largely passed. We see about us a universe of perfect law and order. It is an intelligible universe. We can unravel many of its mysteries. We can discover its laws of action, and even put them down in mathematical formulæ of absolute precision. We can harness its forces to serve our needs. Its hidden secrets yield their meanings to our persistent search for truth. Its minutest units become to the scientific understanding marvelous systems of revolving electrons. When we sweep its heavens with our telescope, we exclaim with Kepler, "O God, I think Thy thoughts after Thee." And the universe is reasonable. It is a rational universe. It is amenable to human understanding. It is never ca-

precious. It always acts in the same way. It is always dependable and law-abiding. Given in the laboratory or elsewhere a particular set of conditions, and the result is invariably the same. To a certain question, regardless of when or where it may be asked, Nature never fails to give the same undeviating answer. And so science has come to live by faith. It has faith in the integrity of the universe. Out of this faith has grown the fundamental assumption, that whatever is necessary to the mind's understanding of natural phenomena is necessary to the phenomena themselves.

But what has this to do with our belief in God? Simply this: that an understandable universe of law and order, a universe that is amenable to our finite intelligence, must have back of it a Divine Intelligence, the accomplishment of whose Purposes manifests itself in creation and whose ways of thinking are the immutable laws which govern the occurrence of natural phenomena. An intelligible universe could never proceed from a non-intelligent source. Without Divine Intelligence as the basis and never-ceasing source of creation, this world would be an insoluble riddle. We should never be able to find any meaning in it. And the very fact that we do find meaning is proof eternal that God exists.

Suppose we were to cut each separate word from this page, stir them all up, and put them together hit-and-miss fashion, the meaning would be utterly gone. There would be words, but no thought. This universe is a thought-creation, and



so is every other creation. The sculptor sees the statue in the unhewn block of marble, before he strikes a blow. Every painting is a thought-creation transferred to canvas. Poetry and music are divine expressions of the human soul. Inventions are masterpieces of creative thought. Let us take a complicated machine. The purpose of every wheel and lever, of every part to the minutest detail, existed in thought before it was materialized in bronze or steel. Otherwise, we should find no meaning in it. It would be out of harmony with the fundamental principles of mechanics. Because no thought was back of it, it would be an eternal enigma. And so with the universe. It is a product of divine thought.

And then again, the scientist assumes an ether, because it is incomprehensible that light and heat can traverse the immeasurable distances of space without something in which to travel. But we shall never get any closer to proving its existence than just this thought necessity. The stuff is wholly elusive, completely intangible. It does not respond to any of our senses, and yet few scientists doubt its existence. We can not explain the observed facts of physical phenomena without assuming that it does. No person ever saw an atom or a molecule. Yet these units of chemical and physical action are as real as the cobble stones beneath our feet. We can not understand the behavior of matter without calling them into "being." Astronomers could not explain the deviations in the path of the planet Uranus without supposing the presence of a there-

tofore unknown planet having a certain definite orbit about the sun and a certain mass. Its discovery became a mathematical certainty, and was achieved almost immediately upon the completion by Leverrier of the necessary calculation. Certain fossil bones brought to Cuvier demanded for their explanation a peculiar type of prehistoric animal, and an extinct species of the elephant became a fact of the geologic past.

Whatever the facts of scientific observation require for their explanation become essential parts of the universe. That is the rule of science, and we may apply it with equal force to the problem of God. Without Him, the origin of our universe and its perpetual maintenance become unintelligible mysteries. Even if the human soul did not demand His existence for the satisfaction of its divine aspirations, science would make Him a rational necessity.

No, science does not dethrone God. Let us blot from our minds the thought that scientific discovery has made necessary the substitution of blind force or natural laws for a Supreme Being. God is just as essential to the true scientist as He is to the theologian. But in place of the grotesque conception of an enlarged man-like Deity, ruling the universe like an absentee landlord, science puts the Divine Immanence of an Infinite Intelligence, that always and everywhere manifests itself in progressive creation. The God of theology is at absolute variance with the divine revelations of the searchers after the hidden truths of the universe.

To such a Deity, the apostles of science can not subscribe. Only a Divine Being who embodies in transcendent degree every manifestation of the universe, material or spiritual, here or at the remotest point of the celestial spaces, can satisfy alike the demands of reason and the esthetic ideals of the human spirit.

## IMMORTALITY

Closely associated with the idea of God is that of immortality. These are the two biggest ideas that ever engaged the thought of men. The whence and the whither of life,—these are the eternal mysteries which philosophers in every age have sought to fathom. As to the whence of life, may there not be truth in the lines of Wordsworth:

Our birth is but a sleep and a forgetting:  
The Soul that rises with us, our life's Star,  
Hath had elsewhere its setting  
And cometh from afar:  
Not in entire forgetfulness,  
And not in utter nakedness,  
But trailing clouds of glory do we come  
From God, who is our home.

And as to the whither of life, we instinctively feel the truth expressed in the following lines:

Thou wilt not leave us in the dust:  
Thou madest man, he knows not why,  
He thinks he was not made to die;  
And thou hast made him: thou art just.

Let us trace for a moment the development of man's belief in an immortal soul. The origin of

this belief takes us back to the primitive times of our prehistoric ancestry. Its beginning was a lowly one, but for just that reason the steady evolution of this fundamental idea into the beautiful concept of modern Christian faith is one of the most notable evidences of man's divinity. Quite likely belief in a soul and its continued existence after death arose from the phenomena of dreams. As the mind of the savage wandered in sleep taking him possibly to distant lands and other hunting-grounds, there grew the idea of another self, a ghost, a spirit, which was able to leave the physical body, and, free as air, to roam the earth at will. And then again, when the slain chieftain or departed friends seemed to appear in dreams to converse with him, the spirits of the dead, to his simple faith, continued to exist, possessed of all the faculties belonging to them here. Fear of death, too, was doubtless an important factor in the origin of this faith. This realm of shadows, the abode of departed spirits, was variously pictured. The Peruvians and Mexicans placed it in the sun; the American Indians imagined a happy hunting-ground; the Polynesians regarded the moon as the home of the dead; the Finns and Australians pictured a distant island; while the Egyptians, Greeks, Romans and Hebrews located the land of shades in a subterranean cavern, a dismal place utterly devoid of the joy of living.

The Hebrew religion, in its beginning, had no certain hope of immortality. The following passage from Ecclesiastes states the early conviction of the



race in which faith in life eternal was to reach its most glorious conception: "A living dog is better than a dead lion. For the living know that they shall die: but the dead know not anything, neither have they any more a reward; for the memory of them is forgotten. Also their love, and their hatred, and their envy, is now perished; neither have they any more a portion for ever in anything that is done under the sun." And again: "For that which befalleth the sons of men befalleth beasts; even one thing befalleth them: as the one dieth, so dieth the other; yea, they have all one breath; so that a man hath no preeminence above a beast; for all is vanity."

Sheol, the shadowy dwelling-place of the Hebrew dead, was variously described as a land of "destruction," "forgetfulness," or "silence." But all the world knows how this idea of the life after death gradually evolved through the later psalmists and the New Testament writers into the radiant visions of early Christian hopes.

#### IMMORTALITY AND THE TEACHINGS OF SCIENCE

Do the teachings of science have any bearing upon the ages-old belief in the immortality of the human spirit? Do they shed any new light upon a question which forever returns to perplex the minds of men? Of course science, in its present state of development, can neither prove nor disprove the future existence of the soul. It can not even produce evidence to support the hypothesis that man has a soul. In the realms of the dead,

the instruments of science are useless. Still, the achievements of modern science have disclosed so many mysteries of the universe that they would seem to promise hope of one day drawing aside the veil which separates the living from the dead. Indeed, the scientific study of personality is revealing the existence of vast realms of unexplored possibilities lying beyond the frontiers of human consciousness. Telepathy, clairvoyance, hypnotism, the mysterious powers of the subconscious mind,—these are enchanting kingdoms but awaiting the conquest of science. They hint at hidden resources of the soul, of illimitable extent and immense significance. We instinctively feel that the race stands upon the threshold of a new era, a fresh departure in its evolution, of which the psychical development of men may be the chief achievement. But let us see what clues the discoveries of science offer, even to-day, for a better understanding of the problem of eternal life.

So firmly do the facts of science grip the mind that one often comes to believe only in the realities of material existence. So illusive and intangible have the properties of the spirit seemed in comparison that the existence of a spiritual realm has been regarded largely as a matter of speculation. But how intangible likewise have the realities of the scientific world become, the discoveries of the last half-century have made exceedingly apparent. Formerly we had notions of hard indestructible entities called atoms. Now we have replaced these chemical units with points of energy, known as

electrons and moving with tremendous velocities in orbits about centers of positive electrification. The energy manifest in X-Rays is able to penetrate opaque matter. Intangible ether waves girdle the earth with the voice of music and intelligible thought. The vast reservoirs of sub-atomic energy, as revealed in the disruption of radium atoms, have created visions of inexhaustible reserves of natural power. Radioactivity, too, has brought the dream of the alchemist to pass. The older facts of gravitation, magnetism, electricity, chemical affinity and the all-pervading ether of space, utterly intangible in every instance, have shattered past the possibility of reconstruction the material world of earlier science. The earth beneath our feet and the air we breathe have resolved themselves into forms of energy as immaterial as the spirits of departed friends. To the challenge, "Show me a single atom which has ever been changed from its eternal form or any proof whatever of a world of immaterial being," science has an answer overflowing with an abundance of the most positive evidence. The hard matter-of-fact realities of the physical universe of yesterday are gone. All is elusive.

We are entirely ignorant of the real nature of the physical forces of the universe. What are gravitation and chemical affinity, magnetism and electricity, heat and light? Have we any more knowledge, in the last analysis, of these physical realities than we have of the immaterial human spirit? What could be more mysterious about the existence of spirit than about that of the ether?

The ether is absolutely immaterial. We can not perceive it with any of the senses. Its properties, entirely deduced by processes of reasoning, seem, to the uninitiated at least, even more fantastical than do those of spirit. Just imagine an individual, a spirit if you please, consisting of ether. He would be invisible, utterly beyond apprehension by any of the physical senses, capable of moving with the velocity of light, immune alike to the intense heat of the sun and the absolute cold of interplanetary space, and altogether ghost-like in characteristics. Is the supersensual world of ether and electrons and subatomic energy any more real than the realm of spirit? Is the idea of a human soul, that which gives to personality its only reality, any more marvelous or improbable than the modern conception of a planetary atom and its wealth of invisible forces? In speaking of this new knowledge, Sir William Crookes said: "We have actually touched the borderland where matter and energy seem to merge into one another—the shadowy realm between the known and the unknown. I venture to think the greatest scientific problems of the future will find their solution in this borderland, and even beyond. Here, it seems to me, lie ultimate realities, subtle, far-reaching, wonderful."

What ultimate reality could be more significant than the existence and nature of the human soul? Do not the scientific discoveries of the past and the seemingly illimitable possibilities of this borderland of ultimate knowledge give ground for faith that, somewhere, somehow in the economy of this



vast universe, there is provision for the immortality of the spirit?

But science offers a far more significant analogy for belief in the immortality of the soul. One of its fundamental laws is that of the Conservation of Energy: energy can neither be created nor destroyed but it can be changed from one form to another. The energy of falling water turns the armature of a dynamo and is converted into electricity, which in turn produces heat, light and motion. If all the energy in each transformation is measured, including that which is wasted, the sum total will be found to equal the quantity contained in the original energy of the falling water. It is neither more nor less. The sum total of energy in the universe is constant. Now does it not seem equally reasonable to suppose that there is also a conservation of spiritual energy? Why should this other form of energy, which seems to be the most vital thing in the universe, an energy without which life itself would be impossible, suffer annihilation any more than the physical energy which it uses? If heat, light and electricity are indestructible, may it not be that personality, the form of energy through which all others is manifest, is equally beyond the reach of destruction? Indeed, it would be most unreasonable to assume otherwise. The annihilation of spiritual energy would constitute a violation of the order of the universe so gross as to be utterly unthinkable. Whether or not personal identity, that is the individuality of the human spirit, persists, science can not say. The

whole trend of scientific knowledge supports the hypothesis of survival, but further than that it can not go.

Let us approach this problem from another point of the scientific compass. Does not the undoubted fact of evolution have any significance for belief in the persistence of the human spirit? Even Darwin said, "It is an intolerable thought that man and all other sentient beings are doomed to complete annihilation, after such long-continued slow progress." Why should a progress of infinite magnitude, beginning in the fire mist and continuing through nebulae and solar systems to the production of a habitable planet, flower in organic life and evolve through countless ages of pain and toil into the personality of the human spirit, only to undergo complete dissolution when the spirit passes from the physical realm? Does such an end seem consistent with the divine harmony of the universe? Surely there is some more worth-while goal for the actors in this drama of eternity. Out of the strife and struggle, turmoil and agony, defeat and victory of the infinite past there must be some gains to be preserved. Why should not life with its amazing powers of persistence run on forever? Has man come thus far only to be destined to go no farther? Should human personality, bought at such frightful costs, in a moment cease to be? The mind recoils from such a possibility. For what purpose do men live for one small fraction of a cosmic moment, if annihilation awaits them at its close? No, the evolution of life can

never end any more than can the transformation of physical energy. The reasonableness of the universe, as we know it, makes impossible any other conclusion. Immortality is as much a rational necessity for the destiny of creation as God is for its beginning.

Deep in the soul of man is implanted the germ of immortality. It was present in the cave man. Its roots have sunk deeper and deeper with the lapse of time. All the learning of the ages has not been able to uproot it. Skepticism avails nothing against it. Although a man may reject all religion, he still clings to the hope of immortality. Its grip can not be shaken off. It has been of tremendous influence in shaping the destiny of civilization. Without it life would lose its meaning and death become the blind alley of human endeavor. It is contrary to all the teachings of science that a latent factor of such vast import to the evolution of physical or spiritual phenomena should be but a fiction of the imagination. It does not spring from nothing and proceed toward a purposeless goal. It has some counterpart in reality commensurate with its immense significance to the realm in which it operates. If for no other reason, we might assert with perfect confidence our belief in immortality.

So far as observation goes, there are no aspirations of the human spirit which do not find their means of satisfaction. The desire for justice, the love of beauty, poetry and music,—these have come to fruition in systems of jurisprudence, works of

art, the literature of every age and the compositions of the masters. Men wished to lighten the drudgery of human toil, and the principles of mechanics awaited their application. They sought increased power for the performance of the world's work, and steam became the burden-bearer of the race. At length there emerged a desire to annihilate space, and the telegraph, the telephone and radio have met the need. Certain venturesome spirits audaciously believed in the possibility of soaring like the birds, and the airplane sprang into being. The desire to alleviate human suffering has flowered in the miracles of preventive medicine and modern surgery. From time immemorial men have longed for a fuller knowledge of the heavens, and the telescope and the spectroscope have made them as an open book. In imagination they pictured the miniature worlds of the infinitesimally small, and to-day a wealth of evidence reveals the truth. Columbus had a vision of an unknown continent, and he found it beyond the seas. Along a thousand paths of scientific discovery, the searchers after the hidden mysteries of the universe have justified the supreme faith of the human spirit in the existence of the unseen. Do not these conquests of faith give abundant ground for the conviction that the yearning of the soul for life everlasting will not find itself unfulfilled?

The progress and spirit of scientific discovery are utterly opposed to the philosophy of modern pessimism which teaches that "man is a mere accident," "immortality is a sheer illusion," "there is practically no evidence for the existence of God,"



“religion is primarily a defense mechanism,” “the freedom of the will has been knocked into a cocked hat,” “such things as the soul, consciousness, God and immortality are merely mistakes of the older psychology,” and that life is possibly but “a fleeting moment of music, warmth and color between two eternities of silence.” Scientific revelations in their broad aspects give no justification for such gloomy views of the universe and the destiny of the race.

The spiritual driving power of civilization still remains unimpaired. Faith in God and immortality, reinforced by three centuries of scientific achievement, is to-day the most precious legacy of the past and the eternal hope of the future.

## CHAPTER VII

### SCIENCE AND THE CHURCH

WHY should men ever have thought that the dissemination of knowledge and the progressive unveiling of the illimitable mysteries of this vast universe of matter, energy and life would diminish the glory of the Infinite or weaken Christian faith? How can a fuller understanding of the wide areas of the unexplored realities of existence restrict the spiritual evolution of mankind? Why should we ephemeral creatures of but a fraction of a cosmic moment start with the utterly false assumption that there is no mystery about creation? What right has any body of finite beings to conclude that there is nothing more to be known than what was imagined by infant peoples in the ages of ignorance and superstition? Does any one really believe that any man-made literature, however inspired its authors may have been, contains more than the minutest fragment of what ultimately may be unfolded? Has knowledge become static? Is it even yet a crime to face the future with an inquiring mind? Shall any of us to-day place ourselves in the same class with those who feared to look through Galileo's telescope, lest they might perceive unwelcome truth? Is a religious faith founded upon such a basis a stable

structure? Is it fit for the twentieth century and after? Should it be a chief function of the apostles of the living truth to combat the spread of learning? Does an interpretation of the Scriptures and of Nature which places a premium upon ignorance and capitalizes so far as possible the credulity of men sound the key-note of forward-looking minds? Why should we not move onward into the open spaces of a wider truth and climb upward to the sunlit heights of a larger understanding? Do we still cling to the belief of the early church that it is wicked to pry into God's secrets? Does the Infinite really require the guardian care of finite beings? Are we not yet big enough to know how utterly futile are the puny attempts of any group of men, however zealous they may be for their conception of the right, to stay the triumphal progress of God's eternal truth? Will men never realize that "the truth is mighty and it will prevail"? Let us then open wide the floodgates of the great ocean of knowledge as rapidly as the finite powers of human ingenuity can do it. Let us forever cease to oppose that clearer vision, that deeper insight, that larger understanding that make both for righteousness and the progressive evolution of mankind.

And to the time-honored question, "Why bother about such matters?" the answer is that the acquisition of knowledge concerning the universe of which we are a part and the development of the human intellect are possibly among the supreme objects of the evolution of the race. Had all men persisted in their comfortable grooves of mental

security, there never would have been a Roger Bacon, a Galileo, a Martin Luther, a Newton, a Faraday, a Shakespeare, or an Abraham Lincoln. Because such men had the courage to loose the fetters which bound them to the traditional past and to reject the false doctrine that the pursuit of truth is an illegitimate calling of mortal men, the world has moved out of the dark shadows of the Middle Ages and into the Renaissance of learning and the bright morning of scientific achievement. The mental status of the race can not stand still. We of to-day must determine whether or not a fossilization of intellectual and spiritual ideals shall not only arrest the tide of human progress, but, for the time being, turn it backward in its course.

#### THE OPPORTUNITY OF THE CHURCH

The church, as she has done often before in her history, stands at the cross-roads. Shall that large and growing element within her folds which welcomes with joy every fresh revelation of God's truth, in whatever form it may come, achieve the leadership of the spiritual forces of mankind, or shall those worshipers of a sacred past, whose faces are perpetually turned away from the bright sunlight of advancing knowledge, gain a temporary victory for reaction, even as they did in the days of Galileo? That is the vital question which confronts the church to-day and upon whose answer depends much of the future of Christian civilization. We can not evade it. The issue has been raised, and the answer must be forthcoming. Shall it be dictated



by enlightened Christian leadership, or shall that group of misguided but tremendously earnest souls whose appreciation of science and the intellectual achievements of modern scholarship touches close to the zero mark be permitted to shackle in large measure the progress of spiritual development for a generation yet to come? It is the same centuries-old question which has confronted the church ever since the Fathers of the Christian Faith, noble men, bred in the minds of ignorant and docile people the utterly false conviction that God, once and for all, revealed in the sacred Scriptures the whole truth about our universe.

Why can not the church make use of truth in any form? Does it not all emanate from God? Is it not inconceivable that He would allow men to come into possession of knowledge which would interfere with their spiritual welfare? If the findings of Christian scholarship have traced to their legendary origins many of the poetic stories of Genesis, can it possibly further the cause of Christ to insist upon them as literal truth, or to make dogmatic belief in them essential to the supposed salvation of the soul? Have not too many such essential beliefs passed by the boards to give pause to such insistence to-day? If the undoubted facts of scientific investigation have demonstrated the truth of evolution and traced man's ancestry to a lowly origin, must we not accept them as fresh revelations of God's universe? Must we not recognize that belief in the divinely dictated authorship of the Biblical account was never more than an assumption? Can we not

welcome these discoveries as giving us a larger knowledge of God's ways of working,—a glimpse, as it were, into His workshop? Why not accept this new accession of divine insight and turn it to the glory of Him whose life is the soul of the universe? Are Christian theologians any more sure to-day of the falsity of evolution than they were three hundred years ago of the fallacy of the Copernican theory of the heavens? Taking a lesson from the chapter of its experience in the "near antiquity" of the seventeenth century, should not the church welcome the opportunity to escape a repetition of its tragic blunder in opposing the classic revelations of the new astronomy? Just as the beauties of the new heavens and their awe-inspiring mysteries have now become one of the chief glories of the God of Christian theology, may it not be that ere long the church as a unit will place the majestic pageant of evolution, sweeping as it does across the infinite reaches of time, alongside of the revelations of Copernicus and Galileo, as one of the most notable evidences of a divine order in the universe? And, when we speak of the church, we must freely and gladly concede that large numbers of its leaders are among the most devoted apostles of truth, from whatever source, that have ever graced the ranks of learning.

A most timely utterance of *The Outlook*, in commenting just now upon the visit to the United States of Dean Inge, of St. Paul's Cathedral, says: "What is significant about Dean Inge's visit is not so much his views about the relative value of Italian Ameri-

cans and Americans of native stock, not even his comments upon the beauty of our sky-scrapers or of our New England villages; what is really significant is the message that he gives as from an Englishman of conservative mind socially who thinks in terms of religious liberalism. The real message that we ought to and need to hold fast to in this country is that which has been reported again and again—that there is and can be no conflict between two kinds of truth, that religion and science are not essentially at swords' points. The real quarrel is between science and theological theories. When the dean says that Christ could not have meant His followers to shut their eyes to any truth, he brings a message which is needed more in so-called liberal America than it is in so-called conservative England. If the church is not to identify itself with theories doomed to become as antiquated as astrology and alchemy, it must adjust its theories of religion to such new knowledge as has become as well established as the law of gravitation. . . . Dean Inge's visit to this country has done a great service by spreading through the press by means of the very pestiferous reporters whom he wishes would let him alone this elementary truth that in the universe we have a revelation of God which the scientist is studying and understanding, and that there is no authority in religion except that which ultimately speaks through the faith of the individual."

Sooner or later the church as a whole must accept this broad view. There is no authority anywhere to constrain a man to believe anything which

his own interpretation of God and Nature does not lead him to accept. Attempts to suppress the truth, or even what is regarded as untruth, will never avail anything. History is full of such tragic blunders. Has the church as a whole not yet learned the lesson? And was there ever a more fallacious view than that the cause of religion can be served by clinging to outworn beliefs which have been shown to be utterly false? Is the church blind to the handwriting on the wall? Are there any in authority who can not see that a generation that is rapidly coming to believe in the triumphant truth of evolution can no longer be nurtured on the mythical Story of Creation found in Genesis, especially when it is well known that the origin of that story has been traced to pagan literature? If a scientifically trained people rejects the idea of miracles, which violate the natural order of the universe and which originated in an age of superstition and ignorance when belief in "signs and wonders" was rife among men, would it not be the part of wisdom not to stress that idea? More light, not less, wider vistas for the soul, larger knowledge, deeper insight, clearer understanding,—these are the vitalizing influences which the church must make her own, if she is not to lose her grip on the minds of men.

Do empty pews and the wide-spread religious unrest, which is sweeping the country, teach nothing? If the everlasting truths of religion need re-interpretation in a new age to meet new viewpoints and larger knowledge, let the church seize the opportunity gladly and march in the vanguard



of the spiritual renaissance. As Doctor Fosdick says in his wonderfully inspiring book, *The Modern Use of the Bible*, "If there are fresh things to learn concerning the physical universe, let us have them, that we may find a deeper meaning when we say, 'The heavens declare the glory of God.' If there are new ways of approaching men's minds, new methods of argument and apologetic, let us have them and not fight like fools with bows and arrows at Verdun, when the One we are fighting for is so worthy of the best that we can do. If there are new powers disclosed by science, let us have them and put them at the disposal of the Lord of life to make our service more efficient! All that we know at the service of the Highest that we know—that is the ideal!"\*

And then again does not the church realize that it is losing its vital contact with young minds when it clings to traditional religious view-points which have been utterly discredited by the teachings of modern science? How infantile in the extreme and how contrary to the lesson written large in the wrecks of theological dogma in the past to attempt to prevent the spread of the truth! Here is the tremendous opportunity of the church. Let her show that she is abreast of the times. Let her take the lead in appropriating to the service of God each fresh revelation of divine truth. Let her prophets, like those of old, catch the vision of a living God, who has never ceased to be the Immanent Source and Guide of the universe, always unfolding in ever-

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\*The Macmillan Company, 1924.

increasing measure the meaning and purpose of the ways of life and creation. Let her break away from the paralyzing traditionalism of a fossilized past. Only by showing in unmistakable terms that her apostles believe in a God who works in the living present, here and now, and by methods never differing essentially in the past from those in operation to-day, can she retain her hold upon the youth of this and other lands. The irrefutable teachings of science have made too indelible an impression upon the minds of the rising generation. It is idle to shut one's eyes to them and utterly futile to attempt to stay the mighty onward sweep of their conquest. Why should any portion of the church leadership persist in remaining blind to the overshadowing significance of these discoveries of science? Why should it not welcome them wholeheartedly as a fresh revelation in modern times of the Divine Immanence? Only thus can the church deserve and win the respect and loyal confidence of those young people who are to be the intellectual leaders of the coming generation.

The church did not hesitate to appropriate the music of Bach, Beethoven and Handel, the painting of Cimabue, Raphael and Michelangelo, and the new Gothic architecture for the service of religion. The discoveries of science are no less an unfolding of the Divine. They are equally worthy of God-service. If the church would gain that new accession of spiritual power of which she stands so desperately in need, let her seize upon this new knowledge, as a drowning man would a life-buoy.

Its rejection means ultimate suicide for the church in her present form, for no organization can endure which opposes the progress of truth. The church can not continue to deny the validity of the rapidly growing wealth of scientific knowledge and survive. The immense spiritual significance of these epoch-making researches must be freely accepted, or nothing will be left to theology but the empty husks of a worn-out traditionalism. Again we say, the church stands at the cross-roads.

#### THE HISTORICAL ATTITUDE OF THE CHURCH

A review of the past often affords the surest key to the solution of present difficulties. We have already indicated in other pages much of the historical attitude of the church with regard to the discoveries of physical science, but a review at this point may be helpful.

The early fathers of the church cherished the most profound belief in the literal truth of the Scriptures. In their view, this sacred literature revealed all that was to be known regarding the universe and the origin of life. The Bible was not only a spiritual guide, but a text-book of geography and science as well. Every word was either dictated by God, or directly inspired of Him. There was not an error within its covers, and there was no possibility of discovering any truth which its pages did not reveal. It was the duty of all men to accept with unquestioning obedience its teachings and their interpretation by the church as final in all matters, both spiritual and material. In the words of St.

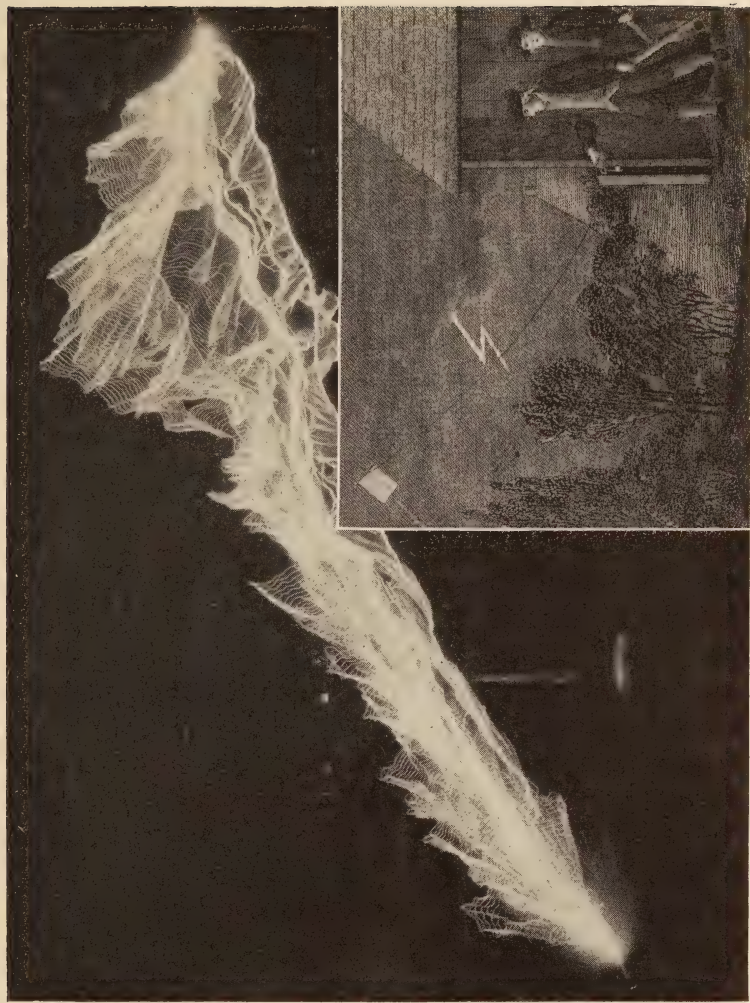
Augustine, "Nothing is to be accepted save on the authority of Scripture, since greater is that authority than all the powers of the human mind." And strange as it may seem, in the face of a host of the most revolutionizing discoveries of an ever-growing science to the contrary, that was the attitude of the church as a whole, both Protestant and Catholic, almost down to the twentieth century. And it is the official policy of a large proportion of Christian leaders even at the present moment.

And then, too, the belief of the early church, as derived from the New Testament, regarded the end of the world as near at hand. With the final judgment rapidly approaching, the saving of souls was the only consideration worthy of men. All else was worse than folly. This withering attitude of the church arrested the normal development of science for more than fifteen hundred years. Pope Gregory VII, in the eleventh century, declared all physical sciences to be "absurdities" and "fooleries." In the twelfth century, St. Thomas Aquinas used his powerful influence to bring science, which was even then making a beginning of the experimental method, entirely under theological control. The Scriptures, too, with theological sanction were made the basis for the practise of magic. In the following century, Roger Bacon, the first great apostle of experimental science, was imprisoned for fourteen years by the ecclesiastical authorities and otherwise relentlessly persecuted because he had sought to give a rational, rather than a supernatural, explanation of natural phenomena. Be-



cause for the first time he showed a correct understanding of the nature and causes of the rainbow, which according to the legend in Genesis was a miraculous "sign" of the Holy Spirit, he was charged with being in league with Satan. This unenlightened attitude on the part of the church, born of ignorance and unreasoning religious zeal, stayed the development of science and deprived the world for centuries of discoveries which would have been of untold benefit to mankind. The ecclesiastics of England displayed marked opposition to the Royal Society and later showed their dislike for the Association for the Advancement of Science. The church authorities, both Protestant and Catholic, for a long period discouraged instruction in chemistry and physics, and, when this was no longer possible, sought to bring it under the domination of theological view-points. These same powers did their utmost to crush scientific research, to which the world owes immeasurable benefits, in its infancy, and afterward discouraged it as dangerous. Theologians gave their support to the false science of alchemy and accepted the interference of the devil in physical phenomena. Against Robert Boyle, the father of modern chemistry, the church was particularly severe. But at last, just at the close of the eighteenth century, Black, Bergmann, Cavendish, Priestley, Scheele and Lavoisier ushered in the dawn of a new day in the physical sciences. The church had done all in her power to stifle their growth, but after the exhaustion of every resource had found herself impotent to stay the irresistible progress of truth.

In another chapter, we have traced the crude notions regarding the geography and shape of the earth, promulgated for centuries by the church, as well as her imaginative structure of the heavens. We must remember, too, that these theories were all based upon a literal interpretation of Scriptural texts, and orthodox belief in them made a basis of Christian faith. We have also noted how such great apostles of science as Copernicus, Galileo, Descartes, Kepler and Newton were denounced as foes of God, because their epoch-making discoveries had drawn aside the veil and permitted men to gain a larger vision and a fuller knowledge of the eternal mysteries of the universe. We have called attention to the social ostracism of Sir Charles Lyell by English churchmen, because his geological researches upset the sacred chronology of Hebrew Scripture, a chronology based upon the most monstrous assumption that ever engaged the thought of men. The ludicrous attempts of the church to explain the fossil record of the rocks afford a capital example of the utter unreliability of theology in the field of science. The long refusal to accept the findings in the ancient cave-dwellings of Europe and the results of archeological research as valid evidence of the vast antiquity of man illustrates the traditional hostility of the church to the reception of new knowledge. A supernatural origin was attributed to comets and thunderbolts and for centuries the belief that they are direct manifestations of divine wrath was preached with the utmost vigor. The mad orgy of witchcraft and the large number of executions,



### ROBBING THE THUNDERBOLT OF ITS MYSTERY

Franklin's historic experiment and artificial lightning produced by the late Charles P. Steinmetz by a difference of electrical pressure of one million five hundred thousand volts.





justified in the name of God by the text, "Thou shalt not suffer a witch to live," constitutes a hideous and ineffaceable blot upon the theological interpretation of Scripture, as applied to one important branch of science. The opposition of the church to the early researches in medicine and anatomy and her inhumane treatment of the feeble-minded, as being possessed of devils, make pathetic chapters in the scientific blunderings of Christian theology. The fierce warfare against Darwin and evolution a half-century ago and the present flare-up over it in this twentieth century of intellectual enlightenment show how little this wretched record of the church in the domain of science has taught to certain portions of her leadership. These well-meaning, but misguided "friendly enemies" of to-day stand where the early church fathers stood, with this important exception, that they live in the most enlightened era of Christian civilization, instead of in an age of scientific ignorance and superstitious wonder. That such harkings-back to a literal belief in the legendary science of prehistoric civilizations should prevail in any currents of American thought now is one of the most astounding facts of modern times.

Let us confidently hope, however, that this unenlightened stand of a powerful faction of the theological forces against the teaching of evolution will soon spend itself and that it will mark the last pitched battle between the adherents of two essentially related forms of universal truth.

With a complete record of defeat to their credit

at every point of the controversy for three hundred years, may we not ask why the present-day opponents of evolution are any more sure of their ground than were their forefathers on a score of other battle-fields? Does not the experience of the past teach them with an overwhelming emphasis that the Scriptures are utterly fallacious as a guide to scientific truth? Was not the Scriptural warrant for the validity of the ancient view of the heavens just as strong as is that for the legendary Story of Creation? Have not the researches of Darwin and a host of others shattered this latter view as completely as did the revelations of Galileo's telescope bring to ruin the celestial spheres and the solid firmament of heaven? Is it not tragically futile to pit against the findings of Christian scholarship and the wealth of scientific knowledge the crude imaginings of infant peoples almost before the dawn of civilization? To say that God told those early writers what to record is, as we have seen, an assumption which has been proved to be utterly false. This assertion may find currency among the uninformed for a generation yet, but its deliberate perpetuation by those who should know the truth is a crime against the very cause which it is sought to serve. To maintain that, even though the literal teachings of Genesis about creation may be false, to teach the truth will weaken Christian faith refutes itself. Christian faith has survived the substitution of the truth of science for the literal interpretation of Scripture so many times that it is perfectly safe to assume that it will continue to do so throughout all future time.

## THE MODERN VIEW

Shailer Mathews, in his book, *The Faith of Modernism*, has well put the modern view of science and the Bible in the following words: "There is no static religion or standardized formula in the Bible. In that fact is one of the most significant of the Modernist points of view, *viz.*, that the true attitude toward God and the true experience of His presence are possible and discernible in the midst of imperfect and even mistaken scientific and other views. The author of Genesis may declare that the sun and stars were created after the creation of the earth and plant life, a conception which our knowledge of astronomy shows is incorrect. But this error does not prevent our sharing in the author's faith that in the shaping of the universe, God was present. So, too, it is only something to be expected when we find in the religious experiences of men who lived before the siege of Troy conceptions of God which to our Christian morality seem unworthy. Such conceptions are, however, no bar to the discovery that with all the human infirmities attributed to Him, the Jahweh of the Book of Judges possessed qualities which had only to be expanded as men's experience expanded, to give the righteous monotheism of the prophets. Belief in the providence of God can be expressed in poetry, folk-tale and legend just as truly as in literal statement."\*

Even in the third century, Origen, one of the most influential of the early church fathers, had sensed the modern view-point. In speaking of the

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\*The Macmillan Company, 1925.

absurdity of a literal interpretation of the first chapters of Genesis, he said:

“For who that has understanding will suppose that the first, and second, and third day, and the evening and the morning, existed without a sun, and moon, and stars? and that the first day was, as it were, also without a sky? And who is so foolish as to suppose that God, after the manner of a husbandman, planted a paradise in Eden, toward the east, and placed in it a tree of life, visible and palpable, so that one tasting of the fruit by the bodily teeth obtained life?”

This and much more in the Old Testament seemed impossible of belief to a great Christian scholar as long as seventeen hundred years ago. And even in the literal interpretation of the New Testament, he found serious impossibilities, contradictions and discrepancies.

Doctor Fosdick, in his *The Modern Use of the Bible*, has well asked: “To be a Bible Christian must we think, as some seem to suppose, that a fish swallowed a man, or that the sun and moon stood still at Joshua’s command, or that God sent she-bears to eat up children who were rude to a prophet, or that saints long dead arose and appeared in Jerusalem when our Lord was crucified? Is that what it means to be a Bible Christian?”\*

No, to that ever-growing host of devout worshipers whose faith in the conclusions of science will not permit them to entertain such ideas, handed down from an age of “signs and wonders,” it may be said with perfect confidence that our present

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\*The Macmillan Company, 1924.



knowledge of the universe in the light of modern research and discovery not only makes these events utterly impossible of belief, but, had they actually happened, a violation of the nature of God himself. The overshadowing truth of the message of science to the church is the fact of the uniformity of the universe and the invariable precision of God's ways of working. He did not set aside His laws in ancient times any more than He does to-day. The modern Christian is no longer compelled to do violence to his conception of the eternal fitness of things by an unnatural belief in supposed happenings which we know originated in the minds of a highly imaginative people, long centuries before the knowledge of a universe of law and order had become a permanent possession of mankind.

And if you ask, "What does this modern view leave to us of the Bible?" the answer is "Everything of any permanent value." The deeps of the human spirit are the same yesterday, to-day and forever. The Bible is the world's classic record of religious experience. It unfolds the most notable example of spiritual evolution. Old ideas of God and sin and justice and worship, adapted only to the childhood of the race, are gradually outgrown. We see them replaced by new and loftier conceptions. In this Book of Books, we feel the religious life of a great people throb with the energy of constantly enlarging religious convictions. Religion is no dead static thing. It glows brighter and brighter with each fresh revelation of the Divine Immanence. The crude notions growing out of the literal interpreta-

tion of ideas belonging to another age are slipping into the background. But the lasting experiences of men—their loves and hates, griefs and struggles, defeats and victories, hopes and fears, temptations and desires—are still in the Bible. The stories of these experiences are as applicable to-day as they were three thousand years ago. And these, the teachings of science can never touch. The spiritual appeal of the Bible is as strong as ever. And this appeal is absolutely independent of any adherence to the outgrown symbols of a by-gone era of world affairs. A knowledge of science has relieved religious teaching of much excess baggage, and has given it immeasurably nobler conceptions of God and the universe, but the fundamental spiritual values of the race, implanted in the evolving soul of man and finding expression in the sacred literature of the Bible, will stand eternally in their own right. They are as indestructible as the law of gravitation or the primal energy from which our solar system sprang. This crystallization in the Bible of these heights and deeps of human experience can never be taken away. With such a priceless legacy, the church may well relinquish its formal adherence to the outgrown symbols of the transcendent conception of the spirituality of the universe.

The tragedy of theological history has been the failure of the church to realize that creation has never ceased and that the discoveries of science, instead of weakening the prestige of God, are the most marvelous manifestations of the Divine Im-

manence that have ever been vouchsafed to the knowledge of men. The apostles of the church and the leaders of scientific research are the foremost instruments for the revelation of the eternal truth of the universe. Co-workers with God, it is a travesty upon the divine progress of the race that they should ever have become opponents in the ages-old search for a better understanding of life and its environment. That large numbers of the most eminent leaders of the church are welcoming whole-heartedly the work of science and each new accession to the world's knowledge is the most hopeful sign on the horizon to-day. When men, particularly their leaders, come to realize what a vast ocean of unexplored knowledge still remains, we shall have an end forevermore to the inglorious attempts to stifle the spirit of discovery and dam up the springs of eternal truth. And when that turning-point in the history of mankind shall come, we shall find science and the church working shoulder to shoulder in the cause of Him whose life is the soul of the universe.

## CHAPTER VIII

### MIRACLES

LET it be stated at the very outset of this discussion that the permanence of Christian faith is in no danger from the triumph of the truth. If for nineteen hundred years and more men have been clinging to a false belief in the occurrence of natural events whose causation would have constituted a direct violation of the divine nature, the world will lose nothing of value, if it allows these empty husks of an outgrown spiritual symbolism to slip into the realm of historic fallacies. Indeed, it will be immeasurably the gainer. A false belief is excess baggage. It contains nothing vital. It is an encumbrance to spiritual progress, and never more so than in this twentieth century of rapidly widening areas of human knowledge. Let us be very frank. So long as the race is here, spiritual progress will never cease, but any organization which deliberately shuts its eyes to the truth and seeks to establish its future upon the fossilized ignorance of the distant past is doomed utterly. If the church would not sacrifice her leadership in this present age of scientific and historic research, she must square her creeds with that rapidly accumulating body of facts with which men in ever increasing



numbers are becoming conversant. It is not a question of what her leaders wish to believe, but of what they must believe. The researches of Christian scholarship have shown the extreme improbability of the occurrence of miracles in the commonly accepted meaning of the term, that is, a violation of the divine order of natural procedure. The discoveries of science have demonstrated their utter impossibility in a normal world. These are the inescapable facts which must be faced. It will avail nothing against them to brand scientists as "dishonest scoundrels . . . burrowing in the ground and stealing away the faith of your children." Christian faith rests upon a basis far more substantial than the long-cherished beliefs of ignorance. If it did not, it would have perished long ago.

First, let us get the historic setting in which the belief in miracles arose. To understand it we must go back to the prescientific ages, which extended from the earliest times to Galileo and after. In those centuries of unenlightened thinking, anything could happen. People believed in signs and wonders. They were fond of the supernatural. There was nothing incomprehensible about it. A miracle was simply an extraordinary method of divine action. The earth and its phenomena were plastic to the touch of the Almighty. The universe was a creature of His creation, which he directed from the outside. He could do anything He pleased with it. Most events happened in a usual way, but at any moment He could choose to act in an unusual way. Such an occurrence presented no difficulty to the

thought of those ages, because natural laws were unknown. No laws were broken, because none had been established. Any natural event whose explanation was unknown was a miracle. Events which admit of the simplest explanations now were then regarded as miraculous. Even to-day, in the uncivilized portions of the globe, the natives believe in a host of miracles. The locomotive, automobile, or airplane, when seen for the first time, is a miracle and a thing for worship. The people of Bible times had not advanced much beyond this state of primitive superstition. A great buoyancy filled the air. They lived in daily expectation of marvelous happenings. With God anything was possible. In fact, if He could not perform miracles, He was unworthy of their worship. Miracles were common in the religions of all the early civilizations. They are not peculiar to the sacred literature of the Hebrews, and many of them are practically identical with those told about other gods and prophets. That was an age of miracles as much as this is an age of science. Belief in them grew in that fertile soil of credulity and ignorance as readily as flowers blossom in a springtime meadow. The only mysterious thing now about this quite natural age of superstitious wonders is the grip which it still has upon religious thought in this day of wide-spread scientific knowledge. Because these events are recorded in the Bible, they are still believed by many, but, when found in almost precisely similar form in the sacred writings of other peoples, they are branded as legendary.

Before we take up the Biblical miracles in the light of historical research and scientific discovery, let us consider a few from the large numbers of those reported in more recent times. It may not be generally known that the age of "miracle working" did not cease until the beginning of the eighteenth century. It continued until the discoveries of modern science inaugurated a new way of looking at Nature and caused the faith in such improbable occurrences to disappear.

The case of St. Francis Xavier, as reported by Andrew D. White in his notable work, *A History of the Warfare of Science and Theology in Christendom*, is typical of the manner in which belief in miracles was fostered during the early centuries of the church and down to the beginning of the modern era. Xavier was a Spanish nobleman of the sixteenth century, who embraced the plans of Ignatius Loyola, the founder of the Society of Jesus, and became a missionary of vast influence in the Far East, dying in 1552 on the desert island of San Chan. Now it is a most significant circumstance that, although Xavier himself has left in his own writings a detailed record of his many years of missionary work, we find in them no event which could possibly be interpreted as a miracle. He made no claim to miraculous power, and none of his brother missionaries in their numerous letters, written and published during Xavier's lifetime and still in existence, make any mention of miracles. Yet his biographies are full of alleged supernatural events wrought by him, and the farther away we get

from the time in which he lived the more luxuriant is this legendary growth. Although Xavier himself has told us with what difficulty he mastered the Japanese language, he is credited with the "gift of tongues," even speaking with such fluency from the very first that the natives thought him one of their own race. In these imaginative writings, scores of miracles stand to the credit of St. Francis. He is said to have raised the dead, to have restored sight to the blind, to have caused an earthquake to punish a blasphemous town, to have made sea-water fresh by the sign of the cross, to have been lifted bodily from the earth and transfigured before the multitude, and to have called down fire from heaven to destroy a wicked village. Most singular of all, on one of his voyages he caused a crab to restore a crucifix which had been lost overboard. On the basis of ten such miracles, selected from the long list of pious stories invented by his industrious admirers, Xavier was canonized in 1622 by Pope Gregory XV.

"Did the people actually believe such tales?" you ask. Yes. There was nothing improbable about such happenings at that quite recent period in the history of mankind. They were the order of the day. People had always been taught to believe in miracles, and they had to occur. The extraordinary circumstance would have been their failure to materialize. This tendency to give a miraculous twist even to the most ordinary events had become almost a public disease among the leaders of those docile peoples. But let us not fail to note that there



is not a shred of evidence to support one of these numerous miracles attributed to Xavier. They grew as all such stories have grown, long after the event, in the fertile imaginations of well-intentioned apostles of religious ideals. Often they have become venerable with age and so deeply rooted in faith and creed that to many their extirpation seems a sacrilege.

The foregoing is only one of the scores of examples which might be cited in the long development of miracle-stories. According to a legend of the thirteenth century, Albert the Great created an artificial man, possessed of life and such marvelous reasoning powers that St. Thomas, unable to answer him, was compelled to break him in pieces with his staff. Miracles without limit were ascribed to the power of St. Thomas à Becket. In time pools and sacred shrines became the abiding-places of miraculous potencies. At the tomb of St. Thomas, leprosy was cured, amputated limbs were restored, a boy seven days dead was brought to life, and a slaughtered cow, whose skin had already been sent to the tannery, was returned whole to the owners. Although Mahomet in his life-time disclaimed any miraculous power whatever, his followers had soon made him responsible for numerous supernatural events. The most astonishing miracles have been attributed to all sorts of historic personages. The theological atmosphere of Christian Europe was saturated with them for centuries. Scores of saints were officially credited with raising the dead, all manner of healing, the gift of tongues, miraculous

disappearance and reappearance, instantaneous transfer from one place to another, and even transfiguration. And this right down to the beginning of the modern era.

It is exceedingly significant to observe, however, that these inventions seldom, if ever, occur in first-hand documents. It is only with the lapse of time that they appear. The closer we get to the actual characters about whom they center, the fewer "signs and wonders" do we find. A very important bearing has this fact, too, upon the Biblical miracles.

But this golden age of miracle working was destined to receive a rude awakening. In the seventeenth century came the epoch-making discoveries of Galileo and the shattering of the theological heavens. Through the mists of ancient superstition a reign of law began to emerge. Men were experimenting along many avenues of scientific inquiry. The modern search for truth had begun its irresistible progress. Many forms of natural phenomena were receiving rational explanations. In this same century Newton demonstrated the law of gravitation and brought to light a reign of order among the members of the solar system. Realm after realm was redeemed from the capricious irregularity of demoniacal agents and celestial beings. The light of truth was at last dispelling the dark shadows of prehistoric ignorance. A reformation was taking place in the thought of men. Geographical explorations were widening mental horizons. Ancient fallacies were receding into the background. In such an atmosphere belief in miracles could no

longer survive. They became the flotsam and jetsam of the crude uncritical ages that had gone before.

The first effect of this new knowledge was to shatter belief in the miracles of contemporary saints. The Protestant Church, however, at first refused to deny their occurrence, but attributed them to the devil. But gradually this belief became too heavy a burden, and it had to go. Next doubt was cast upon any of the miracles credited to the Christian era, and the boundary-line of the miraculous was carried backward to the time of the apostles. Why it should not have been extended to the beginning of recorded history, there is no assignable reason, save the reluctance of the church to relinquish what seemed to be its most direct evidence of divine origin. She could not see that the great spiritual truths of the Bible and the teachings of Christ, secure as they are for all time, need no false support from a belief in the occurrence of incredible natural events. But be that as it is, Christians came to believe only in the miracles of Bible times, which they sought to exalt into a position of unassailable sanctity. Still the conquests of science did not cease, and people came to wonder why the miracles of the Bible rest upon any more secure foundation than did those of the early church or the ones recorded in the sacred literatures of other peoples. That question mark, too, has not yet ceased to cast its shadow across the path of spiritual progress.

## THE BIBLE MIRACLES

The Bible miracles were subject to the same laws of growth as any others. They sprang from the same sort of soil. Belief in them flourished and grew strong in the same atmosphere of credulity and superstition. Their presence in the Bible is no warrant for their authenticity. They in no way differ from the wonder stories of contemporary civilizations. In many instances they are practically identical. Their origin, too, is not to be found in first-hand records.

The miracles of the Old Testament are only such as we should expect from the times in which that literature arose. These writings are not history as we understand modern history. Much is legendary, oral traditions handed down for decades and often centuries before being committed to written form. Neither does any scholar of standing to-day believe that they were dictated by God. They grew like any other literature, and by a process of natural selection came to be regarded as divine. The miracles which these writings record are on a par with those of any other literature or any other time. Belief in their occurrence is no longer necessary to faith in the divine origin of the Scriptures.

Wherever we have the original records of the prophets, they are noteworthy for an almost entire absence of miracle. Hosea, Amos, Ezekiel and Jeremiah make no mention of the supernatural. But in the stories of Elijah and Elisha, who left no original records of their lives, we find ourselves in the realm of the miraculous. Just as in later centuries, mir-



acle stories grew about the personage of Xavier, so did they about these first great representatives of the prophetic line. We are familiar with such marvels as: the raising of a dead man by contact with the bones of the prophet Elisha, the floating of an axe-head in defiance of the law of buoyancy, the smiting of the Jordan with the prophet's cloak and the parting of the waters, the slaying of soldiers by fire from heaven, the ravens which brought food to Elijah, the unfailing jar of meal and cruse of oil, the reviving of the widow's son, the curing of the leprosy of Naaman, the Syrian army smitten with blindness at the call of Elisha, the she-bears sent to eat up mocking children, and the ascension of Elijah in a chariot of fire. Others are also told about these undoubted historic figures of Old-Testament tradition, but they only serve to paint in more vivid colors the unscientific setting of that age of superstitious wonder.

Again when we examine the legendary literature of earlier periods, we find an abundance of the miraculous. As if by magic, plagues appear and disappear in Egypt, the sun and moon stand still at the command of Joshua, water flows from the smitten rock, the walls of Jericho fall down, Lot's wife is changed to a pillar of salt, and the waters of the Jordan part while the people pass. Wherever we find first-hand records of Biblical history, however, miracles almost disappear, or they are few and simple in character. A notable illustration is to be found in the entire absence of the supernatural from the reign of David.

The miracles of the Old Testament are a product of their times. No sacred literature could have arisen in that unscientific age without them. They cast no doubt upon the great spiritual truths of the Scriptures. Those precious heritages from the early evolution of man's divinity are secure for all time. They lose none of their value from being shorn of the miraculous. Because the rapidly accumulating funds of knowledge in every field of inquiry have made necessary a reinterpretation of the Bible, no one need despair. Religious thought must keep step with the intellectual progress of its age. No one would have the world go back to the crude forms of ancestor and Nature worship of primitive men. No more should we to-day wish to substitute the outgrown spiritual symbols of an age of ignorance for the living truth of fresh revelations. The truths of the Bible are in no danger of being obscured. The Almighty is abundantly able to conserve the moral gains of the past and to care for the spiritual welfare of the future.

The miracles of the New Testament cluster about the transcendent figure of Christ. It is unfortunate that we have no first-hand documents giving the record of His life and ministry. None of the books of the New Testament were written until a considerable period after His death. We can not be sure that the sayings of Christ, as recorded in them, are His exact words. They are of course substantially so, for the art of oral transmission was much more highly developed then than now. Many of His sayings doubtless were not preserved, thus con-

stituting an irreparable loss to succeeding ages. The same atmosphere of credulity and superstition which enveloped the preceding and following centuries was also typically characteristic of the period of Christ. If miracles were not found in the sacred literature that records His ministry, it would be a cause for inquiry. Nevertheless, the authenticity of these miracles must be subject to the same critical interpretation as those of any other similar epoch.

It is interesting to note in the New Testament the same inveterate tendency to veer toward the miraculous, the farther we recede from the original sources of information. In the Epistles of St. Paul, the oldest of this collection of writings, no miracles are recorded. Paul probably wrote within fifteen or twenty years after the crucifixion. Had the miracles of Christ become well established at that time, he surely would have mentioned them specifically. His silence is immensely significant.

The authorship of Mark, now conceded by scholars to be the oldest of the Gospels, was not earlier than 65 A. D., a generation after the death of Christ. Matthew and Luke appeared shortly thereafter, while John, an almost mystical book, was probably not written until the second century. With these facts in mind, there should be no illusions as to the traditional origin of these sacred books. Jesus himself wrote nothing. After His death, the recollections of His life were so vivid in the minds of the apostles that they needed no written record of His work. Firmly believing in His

early return, they could see no necessity for one. But He did not return, and, based upon the preaching of His followers, oral traditions inevitably sprang up. Characteristically of the age, stories, exaggerations and legends doubtless intermingled with these historic traditions. From the works of Christian writers of the first three centuries, which fortunately have been preserved to us, we gain glimpses of documents which probably preceded the Gospels as we have them to-day and served as a common source of information for those who compiled them. Probably a majority of the foremost Biblical scholars now rejects the authorship of the Gospel of St. John by the disciple of that name. Its late date seems to preclude that possibility. It must be granted at the outset that nowhere in the four Gospels are we dealing with first-hand information.

It is not our purpose here to consider in detail all of the miracles attributed to Christ. Two or three of them, together with emphasis upon the wide divergence prevailing among the different narratives of the same events, will be sufficient.

Let us take first the virgin birth. Nowhere in the sayings of Jesus does He make any direct reference to His parentage or birth. If there had been anything miraculous about them, Christ would certainly have known the facts, and would have made some allusion to such extraordinary circumstances concerning His personage. Had He been aware of His absolutely unique relation to God, His silence becomes unintelligible. Assuming that Jesus'



own words are the best authority concerning himself, the teaching of Matthew that He had no human father can not be regarded as historical. Paul does not even mention it. Apparently it formed no important part of the Christ tradition at the time he wrote. Neither is mention of it to be found in Mark, the first of the Gospels. Not only does the Gospel of St. John fail to allude to it, but reference is specifically made to Jesus as the son of Joseph. That the story of the Nativity, as found in Luke, is largely poetical, rather than historical, seems to be self-evident. The accounts in Matthew and Luke are neither consistent with the words of Jesus nor with the oldest Gospel. The prophecy in Isaiah of the virgin birth of a Messiah has been shown by Christian scholarship to have been a mistranslation of the original Hebrew. The word "virgin" should be "young woman."

When we consider, too, that the virgin birth is not peculiar to the Messiah but that it was customary in that age to attribute a miraculous origin to great leaders, it becomes clear that the compilers of the Gospels of Matthew and Luke ascribed to Christ only what the people according to their understanding had come to believe must be true concerning so marvelous a Teacher of men. There was no conscious deception. Those writers believed they were telling the truth, but they were not writing history. In the light of present knowledge, Christian faith no longer obligates us to believe in the occurrence of an event which outrages the divine order of Nature and for which there is not a particle of historical support.

No one in passing from Mark through Matthew and Luke to John can fail to observe both the increase in the importance attached to miracles and the growing note of exaggeration which runs through them. In John, the authorship of which is farthest removed from the Christ period, we find Jesus turning water into wine, restoring sight to a man born blind, and raising Lazarus after he had been four days in the tomb. The miracle-working of the New Testament Gospels runs strictly true to form.

Passing over the wondrous works of Jesus' ministry, let us come to the transcendent miracle of His resurrection. No saying of Jesus warrants the conclusion that he expected a *bodily* resurrection. Paul, who was the first to write and who mentions five "appearances," nowhere claims to have seen Christ in bodily form. Indeed, he refers to one of these appearances as a "heavenly vision." Paul was a mystic, and there is no reason for believing that he ever intended to interpret his overwhelming conviction of the repeated personal manifestations of Christ's presence as other than mystical visions. He has nothing to say of the empty tomb. In the Gospel narratives of the resurrection, the utmost confusion prevails. There is no sure tradition as to who found the tomb open, or why any one had come thither. No unity correlates the various statements as to whom and where he reappeared. The freedom exhibited in the treatment of the same incident leads to the irresistible conclusion that these writers were not recording history but legen-

dary traditions which had matured during a generation of unparalleled spiritual unrest. It is impossible to believe that with a reanimated body Jesus both appeared and did not appear in the vicinity of Jerusalem and in Galilee, that He passed through closed doors, that He ate fish, that He offered His hands and feet to the touch of doubting Thomas, and that He finally took flight through the absolute cold of the interstellar spaces. Such a faith is but a crystallization of the crudest sort of spiritual materialism. The world, let us hope, has outgrown it. No longer should it be necessary to strengthen our faith in the reality of the Risen Spirit of Christ by a false belief in empty tombs and a reanimated physical body. If the simple souls of that day found it impossible to clothe their supreme realization of his Unseen Presence in other than material symbols, that is no reason why the defenders of Christianity now should not see things with a clearer vision.

Let us make it perfectly plain, however, that, while history and science must withhold their assent from a belief in the literal truth of the resurrection miracle, they can never account for the transformation of that little timid band of disciples into a bold and triumphant power without assuming in its utmost reality the Christ Vision in their hearts and souls. And therein lies the miracle of Christ,—in that “heavenly vision” and in nineteen centuries of Christian civilization. In His transcendent life in the souls of men, we see the culminating manifestation of the divine personality.

Jesus of Nazareth was the highest Incarnation of the Divine Immanence that the race has known, and His Spirit has never since ceased to be the guiding power of human striving. The Supreme Divinity of Christ and the immeasurable influence of His example are altogether above and beyond any petty ecclesiastical dogmas regarding the virgin birth, the bodily resurrection, or the truth or falsity of his recorded miracles. Were they not, He would be now only a figure in history, but one among other religious teachers. In this scientific age, to make belief in the literal truth of those oriental legends a formal condition of the soul's salvation and requisite to entry into the Christian ministry is a circumstance which "passeth understanding." Why seek, ever so slightly, to substitute the husks of tradition for the living, throbbing truth of spiritual realities? There is miracle enough in the ever-expanding life of Christ in the souls of men to make more than unnecessary the compulsion of a strict adherence to formal creeds unsuited to the present age. Along that way lie ecclesiastical suicide, the strangulation of religious forces, and the temporary staying of the tides of spiritual progress. But eventually the truth will win, and the miracle of the Christ-life, working in the lives of men, will become so apparent that all may understand. When we have climbed to the sunlit heights of a larger understanding and have caught a broader vision of the eternal truth, we shall know that the teachings and example of Christ have lost nothing of value from having been re-



lieved of their burden of the supernatural. A deeper and vastly more significant spiritual faith awaits the coming of that auspicious time.

## MIRACLES AND SCIENCE

The historic meaning of miracles is at total variance with the fundamental truths of scientific discovery. If by miracle we mean a violation of the divine order of natural procedure, a capricious irregularity in the occurrence of physical phenomena, then science must reject the hypothesis, both as highly improbable and utterly unverifiable. There is no reason for assuming that the same unalterable natural laws which we find in force to-day were not in unrestricted operation in Palestine nineteen hundred years ago. In the brief moment of cosmic time which has since intervened, there can have been no change in the divine methods of running the universe. We know that miracles do not occur now. They could not have occurred then. There is no reason for believing that God acts differently in one historical era from what He does in another. The universal law of gravitation expressed the movements of the heavenly bodies then as now. A chemist would have obtained the same reactions between the elements that his laboratory yields him to-day. The atoms, molecules and electrons would have spun and danced in his test-tubes with the same unerring precision of time and movement. The thunder cloud would have responded in the same way to Franklin's kite. The resources of physical power which have revolutionized in-

dustry and society were only awaiting the magic touch of inventive genius to become the burden bearers of the race. The same natural forces were at work refashioning the earth's surface. The heavens presented the same awesome spectacle of silent grandeur. There is no reason whatever for believing that Nature acted in any unusual or erratic way in the Palestine of "yesterday." The only differences between that age and this are those of mental horizons and varying degrees of the revelations of the Divine Immanence. These horizons have broadened vastly, and the revelations of the divine are immeasurably larger and richer than they were in that youthful period of uncritical thought. It was the very exuberance of ignorance and superstition that bred the false idea of miracles.

As to the occurrence of miracles, there is no verifiable instance of a lifeless body that was raised from the dead. There is no verifiable instance of an individual who was born of a virgin. There is no verifiable instance of a human being who was able to rise against the force of gravity and fly off into interstellar space. There is no verifiable instance of such artificial alchemy as that involved in the changing of water into wine. In all the vast numbers of miracles reported from the prescientific ages of religious experiences, there is not one which possesses a shadow of evidence in support of its authenticity. In view of this total lack of corroborating evidence, the case for miracles must be regarded as wholly unproved.

Before we conclude, however, it must be said that there is nothing theoretically impossible about the occurrence of a miracle. Science does not deny this theoretical possibility, but it does say that, practically, miracles are utterly out of harmony with the procedure of a normal world. If one chooses, a miracle may be regarded as the result of a natural law, or method of divine action, which has to its credit but a single event. In the absence, however, of any authentic record of such an event, we are compelled to believe that the phenomena of miracles have never occurred.

There is one class of so-called miracles which undoubtedly have many instances to their credit. But they are really not miracles, for they violate no natural law. I refer to the miracles of healing. Many wonderful "cures" have been effected in all ages, to-day no less than formerly, by suggestion, persuasion, hypnotic influence, and the power of faith. But these are due to the operation of physico-mental laws, which are not yet fully understood. Many of the healing miracles of Christ do not contravene the laws of science, and there was undoubtedly an historic basis for some of them.

With the voice of science so unmistakable in its teaching, it is inconceivable that learned leaders of the Christian Church in the grave deliberations of the council-chamber should seriously debate the wisdom of insisting upon a literal adherence to outgrown beliefs which should have been banished from religious dogma at least three centuries ago.

## CHAPTER IX

### MODERN MIRACLES

IF WE regard a miracle as a wonderful revelation of the Divine Immanence, a marvelous achievement of man in the conquest of Nature, then in this modern age we are living in the golden era of the miraculous. But whether or not we accept this definition of miracle, certain it is that the divine revelations of God were never more manifest than they are to-day. For three centuries the world has been witnessing in a multitude of ways an ever-enlarging unfoldment of the divine. Why should men ever have thought that God has ceased to reveal himself, either in the manifestations of spirit or in the ceaseless evolution of material forces? What were the personalities of Milton, Shakespeare, Tennyson, Emerson and Lincoln,—Galileo, Newton, Faraday, Darwin and Pasteur but revelations of that larger Personality which ensouls the universe? And what shall we say of these marvels of modern science? Can we not see in them the hand of God? Does any one suppose that they are purely human achievements? In the evolution of civilizations and the ideals of men to constantly higher levels and nobler conceptions is there nothing of the divine? This is God's universe. His life is manifest at



every point of creation. Were His revelations to cease, the universe itself would disappear. The withdrawal of the divine energy would mean cosmic death. The life of God himself must depend upon ceaseless activity,—perpetual revelation. So long as creation stands, the inexhaustible possibilities of the Divine Immanence, call them miracles or whatever one chooses, will never cease to unfold.

As God spoke through the prophets of old, so does He speak through the seers of to-day. The telescope, the spectroscope, the microscope and the laboratory are His instruments and workshop. They enable us to search out the eternal mysteries of His creation. They bring the heavenly host, as it were, within hailing distance and make the story of the rocks as an open book. They enlist the material forces of the earth in the service of man, and this co-partnership with God gives an abiding consciousness of the divinity of the human spirit. This mastery of a small part of the physical realm has enabled men to bridge the seas and span the continents. Modern medicine and surgery have redeemed disease and physical suffering from the diabolical reign of demoniacal influence. Communication has become instantaneous. With the speed of light the boundless ether, for aught we know, carries speech and music to the uttermost depths of space. In a very real sense these miracles of modern science have made us citizens of the universe. Like the birds, men have conquered the air. The atoms have been made to yield their secrets. To tap the vast reservoirs of

subatomic energy and turn them to the account of men may be but an initial step in the succeeding conquest of physical forces. And with these triumphs of divine revelation, human suffering wanes, mental horizons broaden, life grows fuller, knowledge expands, and man's adjustment to his environment, or the Divine Immanence, constantly becomes more harmonious. Surely, God is speaking to-day in the lives and deeds of men as He never spoke before.

Let us go back three centuries, and recall some of the outstanding achievements of physical science in the modern era. Harvey's experiments upon serpents, by which he demonstrated the circulation of the blood, constituted an epoch-making discovery in the development of physiological science. The achievements of Copernicus, Kepler, Galileo and Newton have already been told. The geometry of Descartes and the physics of Huyghens became the basis of later investigations of tremendous import. By the close of the seventeenth century, the work of the alchemists, misguided though it was, had laid the foundations for modern chemistry. Astronomy had come into its own. The stage had been set and the curtain had been raised for the enactment of the great drama of recent scientific accomplishment. Slowly, painfully, blunderingly had science emerged into the sunlight of modern triumphs. And what a paradise awaited the workers at the dawn of the new day! Fresh paths opened on every hand. Innumerable secrets were ready to unfold their meanings. Vast realms of unexplored truth beck-

oned the investigator. The newly-discovered force of voltaic electricity had captured the popular imagination, and fresh marvels were eagerly awaited. The atmosphere of every European capital fairly tingled with suppressed interest in all things scientific. Against the background of medieval ignorance and superstition were silhouetted in prophetic forecast the mountain peaks of wonderful revelations. And a group of earnest searchers after truth, worthy peers of any of their successors, like hunters in a virgin forest, began the exploration of Nature's secrets.

Though it may be a myth we like to stand in imagination beside the fireplace of that Scottish home on the River Clyde and watch the boy Watt, as he ponders over the expansive force of steam. Years later we enter his little shop at the University of Glasgow and see him at work on the reconstruction of the Newcomen steam-engine. Some unseen power urges him onward. His imagination has been fired with a great idea. He has caught a vision of a wonderful achievement for his fellowmen. He seeks to shackle the giant Steam and harness him for the world's work. The result is the lifting of human burdens and the inauguration of a new industrial age. We behold a revelation of the divine, a miracle of God.

Scheele, working in the midst of poverty in his little apothecary shop, and Priestley, neglecting his duties as a clergyman to gratify his love for experimental science, discover oxygen. Cavendish, wealthy recluse and passionate lover of truth, de-

composes water and obtains hydrogen. Lavoisier, brilliant chemist of the French Revolution, balance in hand, determines that in the numerous transformations of matter nothing is lost. In the economy of God's universe all is saved. In imagination, we see Davy dancing about the laboratory of the Royal Institution from sheer joy at the discovery of the metal potassium through the agency of the voltaic current. We stand beside him in the lecture room as, with a battery of two thousand cells, he produces the electric arc and the highest temperature then known to science. In that same laboratory we follow Faraday, illustrious pupil of Davy, as, after ten years of patient knocking at the door of truth, he reveals the laws of electro-magnetism and makes plain the pathway to the invention of the dynamo, the electric motor, the induction coil and the transformer. What are these unveilings of eternal truth but revelations of the divine? Do they disclose nothing but a happy redistribution of energy and matter and the activity of finite intelligence? No, the minds of these workers in a new realm were fired with the Divine Presence as truly as were prophet and seer of old. They were instruments for the revelation of truths necessary for the next step in the evolution of the race. Blind chance and the accidental combinations of energy and matter could never account for achievements so divine.

Hargreaves overturns his spinning-wheel and in a moment of divine revelation catches a vision of a new machine to lighten the burden of his fellow-workers. Arkwright chances to see a red-hot bar



of iron being rolled into a long rod by repeated passages between heavy corrugated rollers and in imagination he beholds the "water-frame" for spinning cotton warp. Crompton, pondering over the defects of the spinning-jenny and the water-frame, combines the excellencies of both in the spinning-mule and thereby carries a host of patient toilers past another mile-stone in the progress of the textile industry. Cartwright, an English clergyman, challenged by a number of gentlemen to attempt the "impossible," invents the power-loom and inaugurates a new era in the science of weaving. Eli Whitney loses a coveted position as private tutor in the home of a southern planter and turns his mechanical genius to the invention of the cotton-gin and the consequent establishment of an industry of vast importance to his own and other lands. Creations of the divine personality, which we call genius, were these. As naturally as the flower unfolds from the bud, this group of revolutionizing inventions, at the proper point in the evolution of the race, were brought forth to meet the world's need.

Time and again the scourge of small-pox claimed in death one-tenth of the population of Christendom. Then toward the close of the eighteenth century, Jenner, as though guided by the hand of a Divine Destiny, discovered the secret of preventive vaccination, and wrought a miracle scarcely equaled elsewhere in the history of medical science. Had we stood in the Massachusetts General Hospital on October 16, 1846, we might have heard a young man

exclaim "I have felt no pain." He had just undergone what would formerly have been a painful surgical operation, but, thanks to the God-given discovery of ether by Doctor William T. G. Morton, surgery had been robbed of the major part of its attendant suffering. Those who had come to scoff beheld this almost incredible triumph in awe and silent admiration. No miracle from the unscientific past can compare, in the blessings conferred upon mankind, with this beneficent conquest of pain. What more significant "sign" of the divine can one desire than this temporary stilling of tortured nerves? With such a victory written large in every hospital of the world, why should any one choose to think that miracles have ever ceased?

A generation later in a Paris hospital, an old man kept anxious watch over the life of a peasant lad. For two weeks he had kept the vigil. Every symptom was of the utmost concern. No change, however slight, escaped his eager notice. He could not believe that he would fail in what was to be his crowning achievement in snatching men from death. He had supreme faith in his new-found vaccine for the dread malady of rabies and in the God of the universe whose agent he considered himself to be. This young victim of a mad dog's bite must not die. The hitherto fatal germs of hydrophobia coursing in his veins must be destroyed by the preventive virus with which he had been inoculated. No magic miracle was sought, but only a triumph of medical chemistry and the justification of a great faith in the scientific functioning of human organs. Louis

Pasteur, the father of the germ theory of disease and old before his time in the service of suffering humanity, won his battle with death, for the lad lived and the treatment which the great scientist established has since saved the lives of thousands in every part of the world. To this savior of life and Lord Lister, his comrade across the Channel, the world will forever be grateful for the introduction of antiseptic surgery and the redemption of mankind from the preventable ravages of infectious disease. What miracle recorded in sacred literature can compare in its benefits to the afflicted of the earth with these simple triumphs of medical science? May we not believe that this great apostle of enlightened medical research was divinely sent to earth that men "might have life and have it more abundantly"?

To that little group of distinguished men standing in the Supreme Court room at the Capitol, on May 24, 1844, as Morse telegraphed to Vail at Baltimore that now famous message, "What hath God wrought?" a miracle, more wonderful than any of old, seemed to have been worked. In that hour of matchless triumph, the long years of poverty, struggle, hardship, ridicule and apparent defeat became as dust in the balance. The voice of God had spoken through the divinity of the human spirit. A revelation of the Divine Immanence of vast importance to the future evolution of the race had been vouchsafed to the knowledge of men. This pioneer of a new day, who had dared to believe in the "impossible," had been permitted to draw aside

the veil and disclose a partial vision of yet more marvelous things to come.

And again in imagination we see that company of eminent judges in an out-of-the-way corner of the Educational Building at the Philadelphia Centennial in 1876, awed and silent witnesses, as Dom Pedro, the young emperor of Brazil, dropping the telephone receiver, exclaims, "My God, it talks!" Thirty-nine years later, Bell and Watson, the principals in that historic first message in the Boston attic, on an equally historic occasion, converse with each other across the continent as easily as though they were in adjoining rooms. The dashing of the breakers on the rock-bound shores of the Golden Gate are distinctly heard in the metropolis on the Atlantic sea-board. Nine months pass, and Theodore N. Vail, at his desk at 195 Broadway, New York, speaks into an ordinary telephone transmitter and the boundless ether carries his voice on wireless waves to Colonel John J. Carty at San Diego, California. Sitting in Madison Square Garden, New York City, on Armistice Day, 1921, the writer, one of many thousands, heard the resonant voice of President Harding, speaking over the body of the Unknown Soldier in the marble amphitheater at Arlington, Virginia, say: "We are met to-day to pay an impersonal tribute. The name of him whose body lies before us took flight with his imperishable soul. We know not whence he came, but only that his death marks him with the everlasting glory of an American dying for his country." And so on to the end of the address, and the echoing of theartil-



lery from the Virginia hills, and the sounding of taps. Every word was clear and distinct. Not a syllable was blurred. At the same time a vast audience in San Francisco listened to the ceremonies and, as it were, "stood beside the casket" of America's hero. The reverent thousands on either ocean-side joined with the assembled multitudes at Arlington in singing America and in repeating the Lord's Prayer. New miracles of wire telephony have made possible the union of the whole nation in a single audience. Before events like these, the miracles of old pale into insignificance.

Let us go back nearly forty years to that laboratory in Karlsruhe, Germany, where Heinrich Hertz, the brilliant pupil of Helmholtz and the prophet of a matchless revelation of the Unseen, first demonstrated the properties of wireless waves. Sparks of the divine were those discharges of the Leyden jar, lighting the way to the conquest of a vast new realm of hitherto unsuspected possibilities. A little later in the garden of his father's estate, we see the Italian youth, Marconi, realize the dream of practical wireless telegraphy. We follow him a few years after to the rock-bound coast of Newfoundland and watch him, tense with expectancy, as he listens for the three clicks of the telephone receiver which are to tell him of the triumph of transoceanic wireless. The rest has been a matter of detail, the further expression of the Divine Immanence through a multitude of minds. A miracle of overshadowing significance is this transmission and reception of speech and music through the medium of the intangible ether.

The more recent miracles of modern science did not come one by one, in isolated loneliness with long intervals between. Toward the close of the last century and the beginning of the present, the world was carried forward on a great wave of scientific discovery into immense new spaces of the hitherto unknown. Sir William Crookes discovered the cathode rays, emitted from the negative pole of an excited vacuum tube; and Sir J. J. Thomson and others showed that these rays consist of infinitesimally small particles of negative electricity, called electrons, the raw material of atoms, the fire mist, nebulae and solar systems. At last men were finding the key to the very ante-room to the ages-old mysteries of energy and matter. And then one day, Conrad Röntgen, working in his laboratory, obtained a wonderful new light,—a light whose marvelous rays would penetrate opaque matter and reveal in shadowy, ghost-like silhouettes the structures of many objects. These X-rays, exceedingly short waves in the ether produced at the rate of three quintillion per second, as all the world knows, have become one of the most important agencies in medical diagnosis and the alleviation of human ills. Do we not instinctively feel that revelations so beneficent are immeasurably more worthy of Him who animates the tides of life than lawless “signs and wonders” wrought to awe the superstitious minds of ignorant peoples?

The “mystery” of radium, the alchemy of its transmutation, its vast reservoirs of subatomic energy and wonderful properties have not yet

ceased to enchant the minds of the multitude, even in this day of super-miracles. And why should this divine revelation of atomic secrets ever cease to hold in reverent wonder the thought of men? Already this new element, obtained by Madame and Pierre Curie after the most prodigious research in the history of analytical chemistry, has thrown a flood of light upon centuries-old problems of science. It gives a possible explanation of the source of the solar fires. It helps us to determine the age of the earth. It reveals the structure of the atom. And it holds a vision of sources of energy of such dizzy vastness as to bewilder thought and intoxicate the imagination. Where the path will lead, upon which scientists have entered, no man dares predict. But that the sequel of this unfolding of the divine will be a glorious one, there is no shadow of doubt.

We might speak of the fulfillment of that wonderful prophecy of Tennyson, when in 1840 he immortalized his vision of the conquest of the air in the following lines:

For I dipt into the future, far as human eye could  
see,  
Saw the Vision of the world, and all the wonder that  
would be;  
Saw the heavens fill with commerce, argosies of  
magic sails,  
Pilots of the purple twilight, dropping down with  
costly bales;  
Heard the heavens fill with shouting, and there  
rain'd a ghastly dew  
From the nations' airy navies grappling in the  
central blue; . . .

To mount into the air like the birds, to soar like the eagle, to ride the billows of the sky as a majestic ship sails the sea,—that is a miracle of such recent accomplishment that it almost seems like a passing dream, from which we may even yet awake. The persistent knockings of the Wrights at the door of mystery brought it to pass, and the exploits of a host of daring aviators hold promise of still other miracles to come.

And what shall we say of the stupendous intellectual achievement of Albert Einstein and its large measure of verification by the leading scientists of the world? The mental processes of a great thinker found their counterpart in the realities of the universe. To use an oft-quoted truth, he thought God's thoughts after Him. In one important realm of the eternal verities, he has undoubtedly approached more closely to the ultimate solution of certain fundamental problems of far-reaching significance than has any preceding philosopher. It will be to the everlasting glory of this physicist from across the seas that he has taken us a long way nearer to an understanding of the ages-old mysteries of time and space.

Yes, prophets of God are these modern miracle-workers, as truly as were those whose words and deeds are recorded in the sacred literature of any time or language. So long as the universe stands, the progressive revelation of the Divine Immanence will never cease. The false idea that revelation disappeared with the close of the Biblical era is an irreverent reflection upon the Deity and a gross



injustice to the great apostles of truth in succeeding centuries. Every achievement that leads to larger knowledge, deeper insight, and more spiritual conceptions is a manifestation of the divine in the universe and proof of the divinity of man.

## CHAPTER X

### THE BUGABOO OF NATURAL LAW

WHEN Johann Kepler formulated the cosmic rules which express the undeviating movements of the planets, the world caught its first glimpse of a universe of law and order. A vast realm of the celestial spaces seemed to be redeemed from the influence of a capricious Being and His attendant hosts. Copernicus and Galileo had added the solar system to the known domain of the heavenly bodies. And the great Scientist of Pisa, Padua and Florence had discovered the modes of action of moving bodies at the surface of the earth. Slowly through the mists of many centuries of ignorance and superstition began to penetrate the light of a new knowledge. These pioneers in the task of attaining to a better understanding of this vast universe of which we are a part had begun to draw aside the veil which had hitherto enshrouded in deepest mystery the marvelous uniformity and precision of action which hold sway in the occurrence of natural phenomena. A reign of perfect law began to emerge above the mental horizons of thinking men.

Still at first, men were not deeply disturbed by this discovery of natural law. The full import of its mistaken significance but slowly dawned upon

their minds. And then came Sir Isaac Newton and the Universal Law of Gravitation, if we except Einstein's achievement, the most stupendous generalization in the history of science. Of course Newton did not discover the fact of gravitation. That had been a matter of common experience from the remotest antiquity. The Greek philosopher, Anaxagoras, had even suggested that the same force which attracts objects at the surface of the earth might also hold the heavenly bodies in their orbits. But to no one before the time of Newton had occurred the possibility that this force might be a common property of all matter and extend its influence to the uttermost depths of space. Much less had any one dreamed of being able to demonstrate the law of its action. And then in one of those supreme moments of divine revelation, which have repeatedly punctuated the progress of the race, there flashed across the mind of this intellectual giant of the seventeenth and eighteenth centuries, the idea that the moon might be a falling body obeying the same laws that Galileo had discovered a generation before. Still how could he prove it? That was the mighty query which challenged his genius. All the world now knows that he solved the problem and demonstrated the seeming paradox of a falling body which constantly approaches the earth and yet never reaches it. To explain this apparent contradiction, Newton formulated the First Law of Motion: *Every body tends to continue in its state of rest or of uniform motion in a straight line, unless acted upon by an outside*

*force.* To him it was as clear as sunlight that the resultant path of the original straight-line motion of the moon together with its accelerated motion toward the center of the earth would be the precise curve which our satellite forever follows in its endless journey through space. The mathematical demonstration of the accuracy of the law broadened the earth-bound souls of men and inaugurated a new era in scientific thought.

Still the theological significance of this epoch-making discovery was so totally at variance with the traditional teaching of the church that Newton was immediately denounced as an atheist. The truth was unwelcome, just as it is in certain religious circles to-day. Even Leibnitz, a mathematician scarcely inferior to Newton himself, refused to accept the theory. Doubtless we should not blame these earnest souls too severely, for the idea of law was startlingly opposed to their notions of the divine plan of operating the universe. Every new discovery of law seemed to rule out God. Physical forces seemed to take the place of the direct action of the Deity. A force, like that of gravity, and its unvarying law of action appeared to be a thing in itself, completely independent of a divine source. Men could not see that a natural law inevitably implies a Divine Lawgiver,—that a law which is amenable to human intelligence must be the expression of thought and purpose. They could not rise, all in a moment, to the lofty conception of a natural law as being nothing more than a method of divine action. To minds imbued with



the crude notion of an absentee God, fostered for centuries by St. Augustine and the church, this invasion of law seemed to destroy the world of sacred theological conceptions, even as the sweep of Galileo's telescope across the heavens had smashed the celestial spheres of the scientific romancers of the early centuries of the Christian era. Simple as it now seems, these worshipers of a sacred past did not understand that the law of gravitation only expresses the way in which the universal immanence of the Creator ceaselessly manifests itself in one important phase of cosmic activity. Instead, they saw law usurping the place of God. To their minds He was being crowded out of His universe. That the laws seemed to be true was as dust in the balance. With a loyalty to mistaken theological notions amounting almost to fanaticism, these zealous souls defended their God as valiantly as ever countrymen came to the rescue of their king. All honor to them for their zeal, but let us take a lesson from their example and not in enlightened America to-day repeat the same colossal blunder in fresh fields of equally important scientific discovery.

Newton did not rest content with his explanation of the motion of the moon. In a short time he had shown that Kepler's laws of planetary motion are a direct result of the law of gravitation. Within its majestic sway, he brought, not only the motions of the planets and their satellites, but those of the comets and the meteors as well. In accordance with this all embracing law, Halley calculated the path

and period of the comet which bears his name. Sir William Herschel, who, in a moment of triumph, exclaimed, "I have looked farther into space than ever human being did before me. I have observed stars of which the light takes *two millions* of years to travel to this globe," one evening in March, 1781, brought within the range of his telescope a new world. It was the planet Uranus, and astronomers soon determined that its motion, aside from certain deviations, or "perturbations" as they are called, is true to the Newtonian law. Still, it was felt that these deviations required explanation. Accordingly two astronomers, Leverrier in France and Adams in England, sought the solution of the problem. Independently of each other and solely on the basis of the law of gravitation, these men calculated the path and mass of a planet which, through its attraction for Uranus, would produce precisely the effects observed. Immediately upon the completion of his work, Leverrier telegraphed to the Royal Observatory in Berlin, stating that, should its telescope be pointed to a certain spot in the heavens, a hitherto unknown planet would be brought to view. We now know that this supreme faith in the universality of divine law was rewarded by the discovery of the planet Neptune.

No greater example of faith is to be found in all history. And it was faith in God,—faith in the uniformity of His modes of action and in the trustworthiness of His universe. In one vast realm of cosmic action, God did not operate in a capricious or irregular way. A large area of the universe

had been won over from the unknown to the known. The frontiers of human knowledge had been immeasurably extended. Ancient barriers to intellectual progress were beginning to be broken down, but the inertia arising from fossilized forms of error was tremendously difficult to overcome. It has always been thus, and scarcely less so in this age of boasted enlightenment than it was in the early days of scientific discovery. Intrenched ignorance and content therewith are traditional foes to the irresistible forward movement of civilization into larger fields of knowledge and wider intellectual horizons. And yet such glorious scientific achievements as the discovery of Neptune made irreparable breaches in the ranks of those whose faces were forever turned toward the past. Slowly the truth about the universe asserted itself, and the new conception, based upon actual facts, was found to be immeasurably more significant and beautiful than had been the crude imaginings of ignorant peoples. And of immense import, too, is the fact that these discoveries did not weaken the religious faith of those pioneers whose patient researches unveiled something of the eternal mysteries of the heavenly hosts. Few concurred with the astronomer who said, "I have searched the heavens with my telescope, and I can not find God there." Gradually, the starry firmament was found to be "crystallized mathematics" and, so far as men's knowledge extended, a perfect system of undeviating law and order reigned. And yet it became increasingly apparent to thoughtful minds

that a universe cast in a mathematical mold and operating in accordance with invariable laws of cosmic action must be the product of a Supreme Thinker. Otherwise men could have found no meaning in it. The simplest interpretation of Nature would have been utterly impossible. The law of gravitation would have remained an unsearchable mystery to the end of time. Ignorance would forever sit upon the throne, even as it did throughout the long night preceding the dawn of scientific triumphs.

Natural laws do not explain *why* the universe acts as it does, but only *how* it acts. All science can discover about physical forces is their *habits* of action. Misunderstanding of these simple truths has been responsible for a deal of theological controversy. And the universe is not governed by laws, in the sense that an outside power issues decrees to which it compels obedience. Natural laws are simply the modes of universal procedure according to which the Divine Immanence, which is forever and everywhere present, ceaselessly expresses itself. They are but the uniform lines of behavior along which the Eternal Life of all created things manifests. But it is utterly unthinkable that physical forces and natural laws could operate in perfect harmony without the indwelling presence of a Divine Being, whose life and modes of action supply the energy and guidance without which the universe would go to smash and resolve itself into irretrievable chaos. No, let us rid our minds of the false idea that physical forces and natural laws sit



over against the Deity in perpetual hostility to the supremacy of His divine prerogatives. One would be as impossible without the other as light without darkness. As well try to think of an individual without a personality, as to attempt to conceive of God apart from those multitudinous forms of divine action which we call natural laws. There is nothing whatever in the idea of natural law to interfere in the slightest degree with the most spiritual conception of the relation existing between God and His universe. What the flower is to the life which informs the stalk and root, so are natural phenomena to Him who is the Soul of the universe and the source of its being. The laws of life,—mere formulations of methods of growth,—are as vital to one as to the other. There is no more ground for hostility between the ideas of natural law and divine action than there is between our knowledge of the expansive force of steam and the controlling hand of the engineer on the throttle. God and natural law are as inseparable as the north and south poles of a magnet. A natural law in and of itself is an impossible abstraction. Gravitation is not a “rebellious Titan” setting up a little kingdom of his own in opposition to the sovereignty of God. The discovery of the law of its operation simply enables us to catch a glimpse of how God acts. And so of every other physical force and natural law. Any view which erects a physical force and its mode of action into a little god, unconsciously at least, reverts to the barbaric idea of many gods.

As has already been intimated, the strange notion arose that the extension of the realm of natural law automatically vacated the presence of God. Wide areas of the universe became godless. The discovery of a reign of law seemed to leave nothing for God to do. Many have agreed with Comte that "the time has arrived when we may escort the Creator to the edges of the universe and bow him out with thanks for his past services." In the theological view, the only corner of the universe left for the exercise of His capricious action, through divine intervention and miracle, was that in which the reign of law had not been traced. For long, comets, thunder-bolts and physical disease were thought to be beyond the reach of scientific explanation. But these, too, have been shorn of their supernatural origin. These theological apostles of a losing cause, fighting desperately in defense of traditional error and with their faces forever turned away from the fresh revelations of God's eternal truth, have lost every battle in the history of the centuries-old controversy. As they view the rapidly dwindling area of their little domain, the only province left to their supposed guardianship seems to be the creation of the universe by divine fiat at a comparatively recent moment of cosmic time. The law of evolution is the modern octopus which must be slain, if the divinity of the universe and Christian faith are not to perish. Miracles, too, seem to be passing into eclipse, and for that ancient legacy of ignorance and superstition, the defenders of a totally false conception of God and Nature valiantly contend.

But, as has been shown elsewhere in these pages, the law of evolution has been amply established by an overwhelming wealth of direct evidence, and the fiction of miracles has been traced to its origin. The battle still rages, but the theological cause is forever lost. Just as light dispels the darkness, so does the irresistible conquest of truth overcome error, however sincere and devoted its misguided defenders may be. Evolution is simply God's way of working. It does not eliminate Him. It shows creation as progressive, never ceasing. It extends the time of accomplishment into the past for untold eons and carries it forward into all eternity. Against an hypothesis of special creation without a particle of evidence in its support, it places a theory so abundantly attested by actual facts that scientists already recognize it as a law little less comparable in validity to the law of gravitation. If theologians are to overthrow it, they must bring in opposition something more than the myths and legends of the prehistoric past. The time has long since passed when Scripture may be quoted in defiance of natural laws. Through the Scriptures runs the strong tide of spiritual truth, but not that of literal scientific fact. The tragedy of the whole controversy has been failure to recognize this outstanding truth.

Scientists, too, have not been without fault. The crass materialism of a generation ago, typified by the school of Ernest Haeckel, was as stupid as the unreasoning opposition of theological dogmatists. The attempt to explain the universe by the operation

of purely mechanical forces and natural laws, devoid of any directive agency, was as crude as any of the impossible notions of the defenders of the faith. The erection of the scientific abstractions of matter, force and energy into distinct entities, capable of independent action, and the surrender of the universe to blind chance were on a par with the superstitious spirit creations of prehistoric times. That the law of evolution was at first regarded as dispensing with the necessity of God is no credit to the early exponents of this epoch-making view of creation. The evolution of the earth and organic life from very simple beginnings through the action of blind mechanical forces and the operation of self-directing natural laws is strictly a sleight-of-hand performance. Given the potentialities of solar systems and living things in the latent energy and cosmic laws of primeval chaos, and of course the scientist can bring them forth, just as the juggler pulls from his plug-hat all that he has magically concealed within it. But the real problem is still there. Only a simplification of words has occurred. The facts are as mysterious as ever. Back of these potentialities of infinite magnitude must stand a first cause as big as the universe itself. And that can be nothing less than what the theologian calls God and the scientist designates as the Divine Immanence of all creation. Wherever natural laws prevail, we now see only the manifestation of the thought and action of the Supreme Lawgiver. True, many scientists do not yet accept this view, just as many theologians still cling to the dogmas of an



outgrown religious faith. But whatever the ultimate truth may be, we can be perfectly sure that sometime in the eternal years of God it will mightily prevail. Neither the theorizing of earth-bound scientists nor the gross misconceptions of dogmatic theologians can stay its triumph.

From the early beginnings of Kepler, Galileo and Newton to the vast achievements of the nineteenth and twentieth centuries, the discovery of these divine methods of cosmic action has been one of the chief ends of scientific research. Laplace formulated the Nebular Hypothesis to account for the origin of solar systems. The principles of chemical action discovered by Priestley, Cavendish, Scheele and Lavoisier brought to an end the reign of the alchemist and redeemed a large area of natural phenomena from capricious influence. Franklin robbed the thunderbolt of its lawless terror. Faraday sought out the laws of electro-magnetic action and laid the foundation for the marvelous electrical achievements of the present age. Watt, Fulton and Stephenson harnessed the giant steam. Berzelius, for half a century the czar of chemistry, did the pioneer work in determining the relative weights of atoms, and the great Russian Mendeléeff with his discovery of the periodic law of the elements unlocked the ante-room to the atomic mysteries. Bunsen through the invention of the spectroscope enabled scientists to analyze the stars and determine their physical states. Helmholtz and Lord Kelvin established the law of the conservation of energy. Morse, Bell, Hertz, Marconi, Röntgen,

Madame Curie and the Wrights, to mention only a few of the great names in recent scientific achievements, have made conquest after conquest in unraveling the ages-old secrets of the universe and in extending the domains of natural law. What the future holds no man can say, but that it will be a glorious one there can be no shadow of doubt. So long as the race is here, the revelations of God will never cease.

Natural law, stripped of its artificial framework and false interpretations, is nothing more nor less than a divine mode of action.

## CHAPTER XI

### ATOMS, MOLECULES AND ELECTRONS

WHAT myriads of infinitesimally small worlds the modern scientist has disclosed! Unseen, utterly beyond the penetrating gaze of the most powerful microscope, and yet as well known as the cobblestones beneath our feet, these miniature systems of primeval units are the raw materials from which creation will forever spring anew. Life may disappear, worlds come and go, this universe resolve itself into nebular chaos, and still atoms, molecules, and electrons, indestructible and eternal, will constitute the building blocks with which the Great Architect will again fashion stars and solar systems. Over against the inconceivably stupendous cosmic systems of the celestial spaces stand these exceedingly tiny worlds of marvelous beauty and exquisite perfection. Unthinkably great, unimaginably small, and yet everywhere a perfect reign of law and order,—that is the tremendous contrast and the divine harmony which this universe presents.

But why disturb our minds with thoughts of entities so infinitesimally small as to be almost inconceivable? Because they reveal the secrets of the ages. They usher us into the very ante-room of the eternal mysteries of energy and matter. They bring

the dream of the alchemist to pass. They disclose wonders more marvelous than were ever envisioned in the soul of the boldest dreamer. The majestic sway of these cosmic units extends from the minutest particle of matter to the remotest bounds of space. They are, as it were, the threads in the loom on which the Master Artist weaves the delicate glow of the beautiful Aurora Borealis and the faint soft beams of the zodiacal light. An electric current is but a stream of electrons moving along a conductor. The wonderful achievements of the radio art are due to swarms of electrons within a vacuum tube. To-morrow, these tireless servants of men may make possible the miracle of the wireless transmission of electric power. And should the scientist discover the secret key to the controlled liberation of the immeasurably vast reservoirs of energy locked up within the electronic systems of the atoms, the race would, indeed, stand at a turning-point in its evolution of such dizzy possibilities as to dwarf into insignificance all the proud achievements of preceding ages. Why should we study atoms, molecules and electrons? Because they bring us into a larger understanding of the fundamental realities of the universe. Because the pursuit of knowledge and of a deeper insight into the revelations of the Divine Immanence is possibly the greatest calling among men. Because this new knowledge makes possible a more perfect harmony between the finite spirit of man and the infinite Soul of God.

We are inclined to fancy that the scientist is thinking wholly along visionary lines when he talks



in such a matter-of-fact way about physical and chemical units which he has never seen and may never hope to see. Still, Millikan, the greatest physicist in America, states that "we can now count the exact number of molecules in any given volume or in any known weight of any homogeneous substance with even more certainty than we can count the population of a city or a state."\* Think of the extraordinary precision with which he places the molecular population of a cubic centimeter of air (a small thimbleful) at "exactly 27.05 billions of billions." We can not go into the methods by which these results are obtained, but we may rely with perfect confidence upon their accuracy.

Possibly we may gain some faint conception of the relative sizes of these cosmic units. A cubic inch of any gas under normal conditions will contain four hundred and forty-one quintillion molecules and still leave "great volumes" of space for billions and billions more to be crowded between them. Matter is porous, and the spaces between the molecules are enormously larger than the molecules themselves. A considerable quantity of salt may be dissolved in water with only very slight increase in volume. Gold may be dissolved in liquid mercury. In each case the molecules of the solid simply make their way between the molecules of the liquid, and still they are separated by relatively great distances. The atmosphere about our planet extends outward to a distance of possibly fifty miles. But, if we could suddenly cool it to two hundred degrees below

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\**Contributions of Science to Religion*, D. Appleton & Company.

zero Centigrade, it would form a layer of liquid air upon the surface of the earth only thirty-five feet deep. And still the molecules would be far from touching. A piece of beaten gold-leaf but one four-hundred-thousandth of an inch in thickness still contains many layers of molecules. A soap film may be blown to a thickness of one three-millionth of an inch, but even yet it is estimated that the molecules lie twenty or thirty tiers in depth. The thinnest film obtainable is that of oil spreading upon the surface of water. Although its thickness is but a fifty-millionth of an inch, it contains a double layer of molecules with an intervening space much greater than the diameters of the molecules themselves. A grain of musk will scent a room for years. A single grain of indigo will distinctly color a ton of water. A tiny bubble of chlorine gas will impart its odor to every cubic centimeter of air in a large room. When we consider the countless billions of molecules which must be poured forth to accomplish these results, we gain some more or less shadowy notion of the exceeding smallness of one of these individual physical units.

But, if molecules seem small, what shall we say of atoms? The diameter of an atom is a million times smaller than the thickness of the finest hair. A cubic centimeter of hydrogen may contain fifty-four quintillion atoms, and yet each atom is an electronic system, the individual members of which are as far apart relatively to their size as the planets in our solar system. On an average it would take four hundred million atoms side by side to measure

an inch. It requires a quintillion of atoms of gold to weigh fifteen grains. Sir Oliver Lodge estimates that the weight of an atom of hydrogen, the lightest of the elements, is a million million million times less than that of a grain of lycopodium powder. Or, we may say that it weighs twenty-five ten-thousandths of a grain divided by *one* followed by twenty-one zeros.

It is the structure of the atom, however, which is now of chief interest to the scientist. In the more than two thousand years intervening between the happy guess of the brilliant Greek philosopher, Democritus, and the very recent conceptions of marvelous electronic systems of atomic units, little change in fundamental ideas occurred. Democritus imagined hard, smooth, indivisible particles, the cosmic bricks which together with empty space made up the multitudinous forms of matter. No problem presented itself. The laboratory and experimental science were unknown. And yet this view was surprisingly similar to the theory so ably set forth by the English schoolmaster, John Dalton, a century and a quarter ago. But there was this vast difference: Dalton's idea of atoms rested upon a solid basis of experimental fact. Later quantitative investigations of scientists demonstrated conclusively that there is some counterpart in reality to these atomic units. Indeed, it became possible to determine with the utmost accuracy the relative weights in which the atoms of the elements combine to form chemical compounds. Berzelius, the great Swedish chemist of a century ago, devoted

his life largely to this work, and Professor Theodore Richards of Harvard has for many years been engaged upon a revision of the atomic weights, which constitutes one of the most accurate and important pieces of research in the history of science. Professor Richards characterizes these atomic numbers as the most significant set of physical constants in the universe. For in the event of the dissolution of our solar system into primeval chaos, it is strictly in accord with these relative weights that the atoms would recombine to form new compounds in the cosmic evolution of another system. Doubtless for all time to come, the atom will remain what it is to-day, the practical working unit of the chemist.

Before we take a peep within the atom itself, let us consider briefly the great generalization known as the Periodic Law of the elements. A little more than a half century ago, the Russian chemist Mendeléeff and the German Lothar Meyer, working independently of each other, discovered an apparent fundamental relationship existing between the properties of the elements and their atomic weights. In the beautiful language of the late Robert Kennedy Duncan, "Just as the pendulum returns again in its swing, just as the moon returns in its orbit, just as the advancing year ever brings the rose of spring, so do the properties of the elements periodically recur as the weights of the atoms rise."\* When the elements were arranged in the

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\**The New Knowledge*, by permission of Laidlow Brothers, Inc., publishers.



order of their atomic weights, it was found that every eighth element seemed to repeat in large measure the properties of the eighth element preceding it.

The law did not prove to be quite so simple as had at first appeared, but with modifications it has remained to this day as a guide of tremendous importance in the correlation of known facts and the discovery of new ones. In the midst of seeming chaos was found a reign of perfect order. The darkness of the unknown broke into the sunlight of knowledge. A larger glimpse of the eternal methods of the Divine Immanence had been vouchsafed to men.

Toward the close of the last century, in rapid succession came those wonderful revelations of the cathode rays, X-rays, and radioactivity with their introduction to a real knowledge of atomic structures. One of the first important items of discovery in this new realm of scientific romance was the electron. Of whatever substance the cathode of a Crookes' tube might consist, it shot off at high velocities small, negatively charged particles, which were designated as electrons. Scarcely in the history of scientific research had a more significant discovery been made. At last it seemed probable that the common primordial stuff out of which the atoms of all the elements are constructed had been found.

Then Sir J. J. Thomson showed that these new citizens of the subatomic worlds consist of nothing but pure negative electricity, and demonstrated that

a moving charge of electricity will possess mass and inertia and be characterized by all the properties of matter. Just consider what a revelation this was: hard and fast matter had become intangible, elusive, imaginary; the atmosphere, the ocean deeps, the rock-ribbed hills, and the substance of living organisms had all been resolved into moving points of electrical energy; matter, except as a convenient term of reference, had ceased to exist. Or we may say that matter and energy had become identical. Never before had men come so close to a knowledge of ultimate realities. When Thomson had measured the mass of the electron and found it to be about one eighteen-hundredth as heavy as the hydrogen atom, the way was paved for the first real insight into that hitherto undiscovered realm of the subatomic.

Let us look within this marvelous electrical edifice known as an atom. For a more convenient view, we will magnify it ten billion times and obtain an average diameter of three feet. But what a revelation! Instead of the hard sphere of the ancients, we behold a porous structure, like the universe, *very* empty. Figuratively speaking, we see a vast solar system with central sun and revolving planets. In amazement, we wonder who ever could have thought it solid. Between the electrons themselves and between them and the central, positively-charged nucleus are vast dreary wastes of space, relatively greater than the celestial spaces between the members of our solar system. An examination of different atomic structures reveals

a fundamental similarity. In each we find a central nucleus and planetary electrons. One very striking fact, however, compels our attention. Although the nucleus is magnified ten billion times, this positively-charged central "sun" is no larger than a pin-point. Its mass, however, is nearly two thousand times that of an electron. And let it be remembered that we are not dealing with an imaginary realm. Every statement is based upon facts as incontrovertible as that two and two make four.

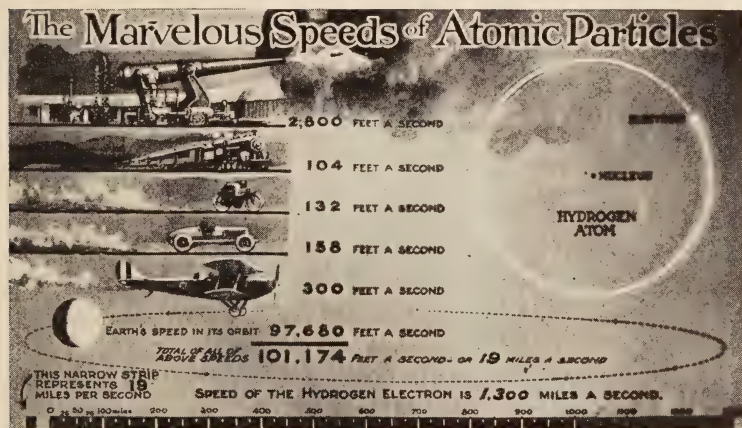
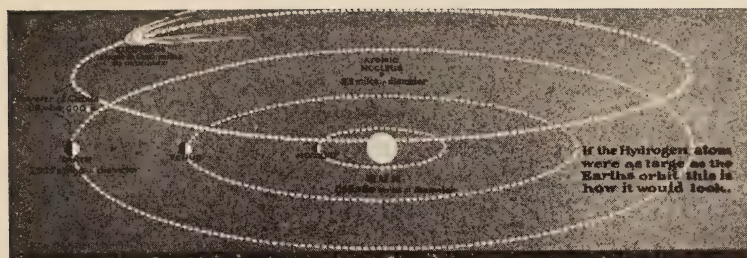
The researches of Moseley, a brilliant young English physicist who was instantly killed by a Turkish bullet before Gallipoli in 1915, have made it exceedingly probable that there are only ninety-two elements in the universe, of which eighty-seven have been discovered. The atom of hydrogen consists of a central nucleus and one electron. Helium has two electrons, and so on in regular order to uranium, which has ninety-two. Upon each nucleus are as many unneutralized charges of positive electricity as there are electrons in its outer sphere of influence. Thus, we now know that the different atoms of the elements are simply varying aggregations of these fundamental cosmic units. The vast complexity of the universe resolves itself into a wonderful simplicity. In these recent triumphs of scientific research, we have come very close to the "Eternal Energy" of Herbert Spencer, from which all things proceed.

In the natural alchemy of radium and the disintegration of its atom, we have direct experimental proof of the electronic systems of subatomic struc-

ture. Radium, spontaneously and without ceasing, gives off three kinds of rays,—alpha, beta and gamma. The alpha rays have been proved to be positively charged atoms of helium shot off with a velocity of about twenty thousand miles per second. The beta rays turned out to be identical with the electrons of the Crookes' tube, projected in a constant stream with velocities ranging from sixty to one hundred eighty thousand miles per second. And the gamma rays have been shown to be X-Rays, differing in no way from those discovered by Röntgen. In this disintegration, new elements arise, and large quantities of energy are liberated, due to the emission of electrons. Other elements, chiefly uranium and thorium, have been shown to possess similar properties. Indeed, uranium is thought to be the ancestor of radium. Possibly, all of the elements may be found to exhibit this remarkable fact of atomic disintegration to some degree. Could our view extend backward into the infinite reaches of the past and forward throughout the countless eons of the future, we might behold an evolution of the elements, birth, maturity and decay, comparable with that of organic structures and the possible evolution of solar systems.

The key to the vast reservoirs of subatomic energy, exhibited in the natural disintegration of radium and known to be locked up within the electronic systems of other elements, is one of the most fascinating goals in the future investigations of these indefatigable searches after the eternal mysteries of the unseen. According to Professor





Courtesy Scientific American.

## THE ATOM—A MINIATURE SOLAR SYSTEM

The top view shows an atom of hydrogen magnified until its orbit is 186,000,000 miles in diameter. On that scale the nucleus of the atom becomes 3.5 miles in diameter and its solitary electron 6,500 miles. Is it any wonder that when these electrons, moving with their tremendous velocities, break loose from their moorings, as in the disintegration of radium, they should liberate vast quantities of energy?



Le Bon, of Paris, the energy contained within the smallest French coin is equal to eighty million horse-power. A single pound of ordinary matter possesses enough latent energy to drive all the ships of our navy. Sir Oliver Lodge estimated that the energy within the atoms of an ounce of water, if liberated, would be able to lift the German fleet sunk at Scapa Flow and place it on the mainland. The power contained in the atoms of a single breath, in the opinion of Robert Kennedy Duncan, would run the workshops of the world. Shall we ever be able to tap these inexhaustible founts of energy and control them in safety for the service of men? Time alone can tell. It may be but the next step in the evolution of our knowledge of the Divine Immanence. The revelations of the present give promise of still more marvelous ones to come. Knowledge, gaining momentum enormously with each new accession, is bound to expand, quite possibly beyond the dreams of the most enlightened seers, in the decades and centuries to follow. Faith in the immeasurable possibilities of this divinely ordered universe and ceaseless knockings at the gates of Eternal Truth will bring revelations of insight and understanding in equal proportion.

The invention by Bunsen and Kirchoff of the spectroscope, that marvelous instrument for searching out the mysteries of the heavens, has led to revelations of immense significance. The light from nebulae and stars caught by this instrument and passed through its dispersing prism at once discloses the composition and physical state of its

source. The atomic structure of each element produces a characteristic spectrum, unduplicated by any other substance. This product of human ingenuity placed before the eye and brain of man reveals the identity of electronic systems, at such infinite distances away that the light which bears the message may have been a half million years en route. In the hands of Sir Norman Lockyer this device made known the existence in the atmosphere of the sun of prodigious quantities of helium. When in later years scientists discovered that helium is an atomic disintegration product of radium, with its accompanying liberation of energy, a possible explanation of the source of solar heat became apparent. This and more the spectroscope has revealed to a host of patient searchers of the celestial spaces. Can we doubt that such revelations are as truly divine as any which have occurred in any other age of world history? Can not God speak through the telescope and the spectroscope as certainly as He can through the mystic visions of seer and prophet? How did men ever get the false idea that the Voice of God has been stilled in these later centuries? No greater error was ever made. The Divine Immanence was never more apparent than it is to-day, and there is no shadow of doubt that its manifestations will continue to increase in even larger measure throughout the ages.

Is it possible to believe that electronic worlds as majestic in their reign of perfect law as the stupendous systems of the starry heavens have come into existence without the guiding thought and



purpose of an Intelligent Creator? Could blind chance and the accidental evolutions of these cosmic units of Eternal Energy result in systems so amenable to our human understanding? Utterly unthinkable is such a monstrous view. Intelligible worlds, whether they be a part of the infinite depths of space or constituent members of the ultra-microscopic realms of the unseen, can never proceed from a non-intelligent source. At one with the physical energy of atoms, molecules and electrons must be the spiritual energy of Him who ensouls the universe.

## CHAPTER XII

### RELATIVITY AND SPIRITUAL REALITIES

Do THE bewildering paradoxes of relativity and the new knowledge which Albert Einstein seems to have unveiled for the intellectual contemplation of men have any bearing upon the spiritual realities of the universe? Has absolute knowledge, like absolute motion, reached the vanishing point? Just as scientists have resolved indestructible matter into marvelous systems of intangible subatomic energy, is it true that all knowledge is relative? Is there nothing, standing in its own right, fundamentally and everlastingly unchangeable? Is everything in ceaseless flux? Is the integrity of the universe at stake? Does the Einstein theory, described by some one as "a contradiction in terms, which, nevertheless, seems to be a demonstrable fact," forever discredit what have been universally regarded as the eternal verities of existence? What is the message of Einstein to the seekers after spiritual truths? A little consideration of this epoch-making intellectual achievement may throw light upon these perplexing questions.

First, let us discover, if possible, something of what this strange doctrine, so upsetting to traditional beliefs, really teaches. Were it not that

scientists have verified almost to the letter some of the startling predictions of this disturber of universal peace, we should long since have consigned Einstein and his ideas to the realms of pure speculation. But, in this new age of shifting viewpoints and intellectual upheavals, facts, whatever their import and however revolutionary they may be of ancient forms of thought and belief, can not be ignored. And Einstein introduces us to a marvelous new world of such entrancing metaphysical possibilities as to compel our interest.

What is the whence and the whither of this universe in absolute space, the empty void of infinity which begins nowhere and extends beyond the limits of our imaginations? And time, whose beginning and end we can not conceive, what is it? Einstein tells us that the two are indissolubly linked in a four-dimensional time-space universe, and that both time and space are largely fictions of the imagination. Empty space is an absolute unreality. If there were nothing to put in it, space would be non-existent. And, if nothing ever happened, there would be no need of time. Time is Einstein's fourth dimension. An object can not exist in space without also existing in time. Spatial existence of any description implies duration. The moment one begins construction of any kind the time-factor enters into it. An event can not be defined without locating it in a three-dimensional space and stating its position if a fourth dimension of time. We might locate a human tragedy at the intersection of two streets, on a

certain floor of a building or in the basement below, and at a particular moment of the day. Each element is essential. And the values assigned to space and time are wholly relative. To the insect at our feet, a tiny mound of earth may be a mountain and the insect's brief tenure of life as three score years and ten. Hours may sometimes seem as fleeting seconds and one short minute as an eternity. Upon the tragic rescuers at some scene of grief and woe time makes no impression, while the prisoner at the bar waiting for the verdict of the jury ages with the anguish of suspense. In the presence of a great sorrow all else fades into insignificance. Our measurements of time and space are all relative,—relative to artificial measuring rods or mechanical devices and arbitrary units. There is nothing absolutely fixed in the universe. Spatial dimensions are determined by reference to man-made yardsticks, and our measurements of time are relative to the movement of hands over a dial and the motions of the heavenly bodies.

Again, let us take the idea of motion. There is no such thing as absolute motion. That is Einstein's contention. Suppose we drop a heavy object from an airplane. It does not fall to the earth in a perfectly straight line and with uniform velocity. The gravitation of the earth gives to it an accelerated velocity toward its center; it still partakes of the forward motion of the airplane; the rotation of the earth carries it forward at the rate of one thousand miles an hour at the equator; at the same time the earth is revolving about the sun with



a speed of eighteen and a half miles a second; and our whole solar system is being borne toward the star Vega with a constant velocity of twelve miles a second. What seems to the casual observer to be a quite simple path turns out to be a long and tortuous curve. The motions of the heavenly bodies are relative. They move with respect to one another, but is there any absolute motion through space? Einstein says "No." Indeed, were the sun, moon and stars veiled from our view, we could never discover *any* motion. Even as it is, our solar system is like a swarm of bees flying within a hive. The bees are moving with respect to one another, but it is impossible for them to discover whether their hive is being carried bodily through space. The conclusion of Einstein and his followers is that all motion is relative. There is no such thing as absolute motion, independent of any factors of reference.

The now famous experiment of Michelson and Morley, performed first in 1886 with apparatus of the utmost precision, had seemed to demonstrate that the earth does not drift through the luminiferous ether with which scientists have filled all space, as it would do if our planet possessed any absolute motion, and a later experiment of Sir Oliver Lodge has shown that the ether is not carried along with the earth. It was upon this basis of experimental fact that Einstein proceeded to build his theory of relativity. It consists of two fundamental propositions: all motion is relative, and the velocity of light is, not only independent of the motion of its source, but the highest possible velocity to obtain.

As a result, certain apparently contradictory ideas became irresistible conclusions of scientific thought. Suppose we could move away from the earth with the velocity of light. The hands of a clock left behind us upon the earth would seem to stand still. All would become motionless. Events would cease to occur. We should forever remain abreast of a particular set of light waves, and the succeeding waves bearing the impress of changing events would never overtake us. We should never grow old. If we could move with a velocity greater than that of light, we should overtake the light waves carrying to the uttermost depths of space the ineffaceable stamp of events occurring in earlier years, and we should actually grow younger. The panorama of history would be reviewed in reverse order. The mass of a body, hitherto regarded as invariable, would assume infinite proportions at the velocity of light. The apparent length of a yardstick, moving directly away from us at this speed, would be reduced to zero. In other words, our judgments of motion, time and space are relative to the observer. Were an observer seated upon a meteor, moving past our earth with a velocity approaching that of light, to witness events here, his impressions would be vastly different from ours. Both would be right, for it is all a matter of relativity.

Upon a planet whose inhabitants were devoid of the sense of sight, would there be any such thing as light? Yes and no. In the physiological sense, there would not be, but the ether waves would

exist just the same. The physical fact of light would be as real as anywhere else in the universe. And so with sound. The roar of Niagara would be like the silence of the grave to an utterly deaf person, but the condensations and rarefactions which affect the sense of hearing would be no less real. To a color-blind person or to an individual viewing a landscape through a bit of colored glass, hues seem vastly different from their appearance to one of normal vision. To the trained ear of a Beethoven, the rendering of a piece of classical music may give exquisite pleasure, while to the savage it is nothing but noise. In the transparent air of desert climates, distances are wonderfully deceptive to the tenderfoot. He is relating them to the sense impressions of another atmosphere. The infant may believe the toy automobile upon the floor to be as large as the distant car upon the highway and a near-by man as tall as the neighboring flagstaff. He has not yet learned to interpret size in relation to distance and perspective. The moon hanging just above the horizon appears unduly large. As a matter of fact the visual angle which it subtends on the retina is no larger than it is when the moon is high in the heavens. We are simply judging of its size in comparison with the known size of some familiar object relatively much nearer than the moon, and the result is a false impression. The spaces between the electrons within that marvelous temple known as an atom are relatively as great as the distances between the members of our solar system, and yet inconceivably small. Examples

might be multiplied, but enough have been given to show that much of our knowledge is relative,—relative to the observer, his personality, his state of development, his view-point, his environment and many other factors. Our knowledge is often partial. We see through a glass darkly. We catch a glimpse of the truth, we obtain deeper insights, larger understandings, and never cease to hope for more complete revelations. But absolute truth is seldom reached.

Einstein's theory of gravitation is equally astonishing. For the first time among men, this bold thinker has had the temerity to deny the existence of the universal force of gravitation. Such a force, he regards as wholly hypothetical. A planet may follow an elliptical path about the sun and a body fall to the earth, not because of any mysterious attracting force, but because these paths prove to be the lines of least resistance through a space which has been warped and curved by the presence of large masses of matter. How space can be curved, is as unpicturable as are the axioms of geometry. But one may be as true as the other. To quote from my *Masters of Science and Invention*, "If we should find that a marble placed at any point near the walls of an apparently level floor always rolled to the center of the room, either one of two possible explanations might be given. There is some force attracting the marble, or the floor is curved. So with gravitation. Either there is some force of attraction common to all matter, or space is curved. Newton took the former view. Einstein has chosen the latter,"

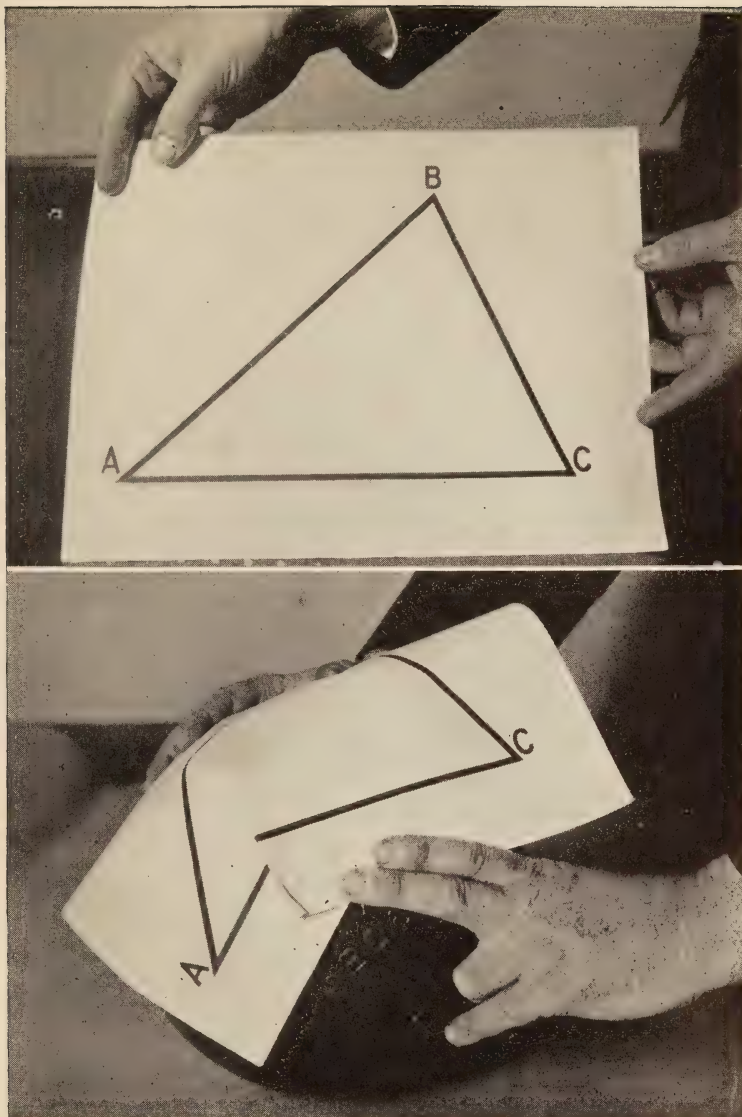


An essential item in Einstein's curved-space theory is the hitherto incredible assumption that a ray of light in passing near to a large mass of matter like our sun should be warped out of its straight-line path. Eclipse observations have since abundantly justified this conclusion. And furthermore the angle of deflection of the ray of light from a distant star has been shown to be very close to that predicted in advance by Einstein. It is this remarkable coincidence, together with the explanation of a centuries-old discrepancy in the orbit of Mercury, which has prevented the side-tracking of Einstein and his views. He has looked at the universe from a new angle, and has undoubtedly approached more closely to a knowledge of certain ultimate realities than has any other thinker. Again, it is a matter of relativity.

But what have these considerations to do with the spiritual realities of the universe? Just this: that judgments of spiritual truths may be at many points just as relative as they seem to be in other spheres of thought. Outside of the truths of reason, there is very little that can be absolutely proved. That two and two are four is universally true. Its validity is independent of time or place. This mathematical fact is a rational product of the inherent process of human thought. Its denial is utterly unthinkable. And so, too, the axioms of geometry. Things which are equal to the same thing *must* be equal to each other. Such a proposition admits of no argument. It towers above the great mass of human concepts like a mountain peak

above the lowlands. Just to the extent to which our judgments of scientific and spiritual truths conform to these standards, they, too, are universally true. Often, however, the criteria by which we form them are wholly relative.

Must the mind blindly grope its way through these devious paths of human thought, unaided by any guiding principle? Is there no test of truth? Can we never know when our intellectual processes have reached a stable abiding-place? Borden P. Bowne, one of the most trenchant philosophers of modern times, has laid down this fundamental axiom: *Whatever is necessary to the mind's understanding of the facts is necessary to the facts themselves.* All else is relative, changing, subject to constant revision. This does not mean, however, that the whims of capricious thinkers, the idle imaginings of unclear thought, find their counterpart in reality. Only those concepts whose denial would do violence to human reason may be regarded as true. To me, the idea of God is absolutely essential to a rational interpretation of the universe. And so is belief in immortality as fundamental as the scientific fact of the conservation of energy. These are no more relative than that two and two are four. But that we have reached the ultimate truth concerning the structure of matter is an unproved hypothesis. Much has already been discovered, but knowledge of the final reality is still in the future. It is contingent upon further investigation and relative to the interpretation of new facts. The story of the rocks,



*Courtesy Scientific American.*

### THE RELATIVITY OF SPACE

The upper view shows a triangle drawn in a plane of two dimensions. In attempting to fit this sheet of paper to a sphere the two-dimensional space is distorted. In a somewhat analogous manner our three-dimensional space may be distorted in the presence of a large mass of matter like the sun. To an imaginary being whose ideas of space are relative to a two-dimensional plane the distortion of the paper will be just as disconcerting as Einstein's baffling notion of the warping of space is to us.





as told by the imperishable fossil records from preceding ages, makes the fundamental truth of evolution an irresistible conclusion. But the precise methods by which the Almighty has carried out this cosmic process are still uncertain. They are relative to human fallibility and to a multitude of shifting factors.

Applying this doctrine of relativity to the interpretation of the Scriptures, we see at once that belief in the literal truth of many of their statements is not an essential article of religious faith. The mold in which this literature was cast was warped by human view-points. Its ideas were relative to the age in which it was produced. Often sublime, vehicles of transcendent spiritual truths which have outridden every storm of strife and passion, these ancient categories of human expression are found to be out of harmony with the larger horizons and deeper insights of a later age. The fundamental truths which they convey are as vital as ever, but the outgrown husks in which they were enshrouded have become "as the chaff which the wind driveth away." No better example of the relativity of religious view-points can be found than that disclosed in the evolution of the idea of God, discussed elsewhere in these pages. The various stages of this evolution reflect the characteristic modes of thought and the changing degrees of moral and spiritual insight of their respective times. The Story of Creation, wholly relative to the age of scientific ignorance and superstition in which it was formulated, has now become obsolete,

We are at liberty to retain the fundamental spiritual truth of the divine order of the universe and reject the ancient form in which it was stated. We may hold fast to the "spirit" of religious teachings, and at the same time disregard the "letter," which "killeth." That is the gospel of science and the message of the doctrine of relativity as applied to the Scriptures. In the light of this new vision, old truths become more real, mental horizons broaden, and spiritual realities emerge, transfigured with a larger and truer meaning.

If the message of Einstein had done nothing more than to free the mind from its moorings to the fossilized forms of traditional thought, it would be an achievement of immense significance. That his ideas have also found a large measure of scientific confirmation demonstrates once more that the mental processes of a great thinker find their counterpart in the thought of Him whose life ensouls the universe. No better proof of the spirituality of all creation need be given. This latest voice of the masters of science speaks of truths as everlasting as those conveyed in the utterances of seer and prophet.

## CHAPTER XIII

### THE FAITHS OF THE SCIENTISTS

WHAT have been the religious faiths of the outstanding scientists of the world, past and present? Is it possible for a man to devote his life to the pursuit of physical knowledge and be a Christian still? Is a larger understanding of the eternal truths of God's universe incompatible with His worship? Did God intend that ignorance of His creation should be a chief qualification for His service? Need we fear that a larger understanding of the revelations of the Divine Immanence will place in jeopardy the spiritual welfare of the race? Must we cease our inquiry into the ways and laws of Nature and regard knowledge as a static thing, a stranger to progress and growth? Are the superstitious imaginings of infant peoples to be placed above the revelations of the telescope, the spectroscope and the microscope? Must we disregard utterly the plain story of the rocks? Are we to believe that God would implant in the soul of man this insatiable thirst for knowledge and then condemn him for his legitimate efforts to gratify it? Is there not something wrong with a conception of God which is susceptible of such an interpretation? And is it true that the brightest stars in the firma-

ment of scientific achievement are symbols of agnosticism and atheism? A brief review of this field will serve to clarify certain widespread misconceptions.

Modern science began with Copernicus and Galileo, both devout believers in the divinity of man and in the spiritual truth of the Scriptures. Even the narrow-visioned persecution of the Church could not shake Galileo's faith in God. This prophet of a new age, who with the sweep of his telescope across the heavens brought to ruin the celestial spheres of the ancients and the Scriptural astronomy of the early church, could see nothing inconsistent with such astounding revelations and a theistic conception of the universe. And let us remember that the new knowledge unfolded by this astronomer of the Florentine hills was, in that time of crudity, much more startling in its religious signification than are the present-day teachings of science regarding evolution and miracles. In that age of the extreme literal interpretation of the Scriptures, the voice of Galileo was as one crying in the wilderness, and yet it was the voice of one of the most enlightened seers of any time.

In the very year of Galileo's death Sir Isaac Newton was born. To him it was given to carry forward the work of the great Italian and to establish the new heavens upon the bed-rock of absolute law. Still, in the view of this intellectual giant, the reign of celestial law did not encroach upon the prerogatives of God. Although he was denounced as an enemy of the Deity, no more sincere Christian



ever lived than this British physicist who first explained the motions of the planets and their satellites and immeasurably broadened men's conception of this vast universe, of which our solar system is but a tiny fragment. If new and revolutionary truth regarding the heavenly bodies did not disturb the serene religious faith of one of the most gifted thinkers of any age, why should an increase in our knowledge of Nature precipitate spiritual unrest and turmoil in the minds of any to-day? The memory of Sir Isaac Newton, shining like a beacon light across the intervening centuries, should be a source of strength and inspiration to any who are now meeting with obstacles in the form of ignorance and stagnant thought similar to those which he encountered nearly three hundred years ago.

Among that little group of early workers in the field of modern chemistry, was Joseph Priestley, co-discoverer with Scheele of oxygen. Both were devout men, and Priestley was a clergyman. This new world of chemical knowledge, utterly antagonistic, as it was to alchemy and its mystical implications, was not regarded as opposed to the spiritual teachings of Scripture. Because men in Bible times had gained no inkling of atomic mysteries and did not find in sacred literature a chemical theology, the apostles of scientific research in this field have been relatively freer from the persecutions of ecclesiastical dogmatists.

Among the naturalists of a century ago, the most distinguished was Baron de Cuvier, the founder of comparative anatomy. A man of intense

religious convictions, he could not bring himself to accept the doctrines of evolution, as advanced by Lamarck, and yet he clearly recognized that there have been successive geological epochs in the development of the animal life upon the earth. The work of the great Frenchman upon extinct species of animals paved the way for later views, and he himself held to a doctrine of special creation totally at variance with the orthodox teachings of Scripture. According to his theory, great catastrophic upheavals at intervals of the geologic past destroyed the animal life upon the earth and renewed acts of special creation in each instance replaced it with other species. His investigations, however, showed him that the life now present upon the globe differs radically from that of preceding ages, a view quite contrary to that of Scripture. And yet, this anatomist who could reconstruct the complete skeleton of an extinct mammoth from a single bone, did not reject the spiritual truths of the Bible nor see any essential lack of harmony between his own views and those of Genesis. And the religious zeal of Cuvier was typical of that of other noted scientists of his time.

Lamarck, the distinguished predecessor of Darwin and the founder of the first comprehensive theory of organic evolution, could assert with perfect Christian faith, "Surely nothing exists except by the will of the Sublime Author of all things." Even Darwin could not bring himself to reject the thought of immortality. It is true that Huxley, the great popularizer of evolutionary doctrines of

a half-century ago, coined the word "agnosticism" to express his own nebulous views of God and immortality. He neither affirmed nor denied. But Huxley lived and worked in the heyday of materialistic tendencies which swept the earth during the second half of the last century. His views were a product of his times. And so were those of Ernest Haeckel, the foremost exponent of a thorough-going mechanistic naturalism. It is heartening to know that Alfred Russell Wallace, independent and simultaneous formulator with Darwin of the theory of natural selection and a distinguished scholar in the fields of biological, physical, astronomical and geological science, rejected the mechanistic interpretation of the world. He did not regard life and man as mere accidents. Mind, in his view, was the flower of creation, for the realization of which even the stars in the heavens exist.

Of the great naturalists of the last century, no one would dissent from placing Louis Agassiz in the very forefront. His whole life from earliest boyhood is the story of a passionate devotion to the study of Nature. It is interesting to know that, starting as an atheist, his broad scientific researches led him step by step to a fervent belief in a divine purpose and order everywhere in the universe. His very humanity, however, his kindred feeling for every living thing, would not permit him to accept the Darwinian theory of evolution, although his students were early converts, and, had Agassiz lived a decade longer, there is little reason to suppose that his keen mind could have with-

stood the weight of evidence. The significant thing to observe is that the pursuit of science led him to, not away from, God.

Among the physicists of the first half of the last century, Michael Faraday easily stands first. His researches in the field of electromagnetism alone will rank him as one of the greatest scientific discoverers of all time. And yet, with all his deep insight into the mysteries of physical science, his was one of the most gentle and Christlike characters to be found in the pages of history. To the end of his long and useful life, he preserved a simple faith in God and in the eternal verities of the Christian religion. Of a little later period were Lord Kelvin and James Clerk-Maxwell, whose names will long remain as symbols of intellectual leadership. In his address as president of the British Association for the Advancement of Science at its forty-first annual session, Lord Kelvin said: "Overpoweringly strong proofs of intelligence and benevolent design lie all about us; and if ever perplexities, whether metaphysical or scientific, turn us away from them for a time, they come back upon us with irresistible force, showing us through nature the influence of a free will and teaching us that all living beings depend on one ever-acting Creator and Ruler." And again he wrote: "I believe that the more thoroughly science is studied the further does it take us from anything comparable to atheism." Still, this eminent British physicist was the author of theories concerning the age of the earth and a staunch believer in others



which totally discredit a belief in the scientific accuracy of the first chapters of Genesis. Maxwell, who demonstrated the electromagnetic nature of light and was a mathematical scientist second only to Newton, said: "I have looked into most philosophical systems, and I have seen that none will work without God." Oersted and Ohm, important discoverers in the field of electricity and life-long students of physical science, expressed their deep convictions in the theistic origin and nature of the world.

Immanuel Kant, one of the most profound thinkers of any time and the anticipator of the Nebular Hypothesis of Laplace, was a firm believer in God. It was this great philosopher who said: "Two things fill me with unspeakable awe,—the starry heavens above and the moral law within." John Dalton, the father of the atomic theory of the elements, was of simple Quaker faith. Schwann, the founder of the cell theory of organic structure, Claude Bernard, a pioneer in modern physiology, and Jenner, the discoverer of vaccination, could see nothing inconsistent with the pursuit of science and the integrity of religious faith. Sir Charles Lyell, the first great geologist and an early convert to the theory of evolution, was a devout Christian to the end of his days. James Dwight Dana, foremost among early American geologists, after resisting the truth of the Darwinian view for many years, became an enthusiastic supporter of it, and this without interference with his Christian faith. Gregor Mendel, the Austrian monk, who made

discoveries of farreaching significance concerning the laws of heredity and who founded the science of genetics, did not allow his scientific pursuits to disturb his religious beliefs.

If ever there was a modern apostle of light, a great scientist and Christian explorer of God's universe of truth, that man was Louis Pasteur, the father of the germ theory of disease and repeatedly chosen by the populace of France as the most illustrious of all Frenchmen. No more worthy testimony to his deep religious conviction can be found than that contained in his own words, carved over his tomb: "Happy is he who carries a God within him, an ideal of beauty to which he is obedient—an ideal of art, an ideal of science, an ideal of the fatherland, an ideal of the virtues of the Gospel."

Sir William Perkin, discoverer of the first coal-tar dye and distinguished chemist, in a review of his life shortly before his death in 1907, said: ". . . I thank God, to whom I owe everything, for all His goodness to me, and ascribe to Him all the praise and honor." Benjamin Harrow, in his biographical sketch of this man, who opened up a new continent of unexplored chemical wealth, paid to him the following tribute: "A blameless Christian, a perfect gentleman, a fine type of the old conservative, he lived unobtrusively, worked quietly and intensively, worshiped God, and respected his neighbor."

Of the British scientists of our own time, no more illustrious trio could be named than Lord Rayleigh, Sir William Crookes, and Sir Oliver

Lodge. It is difficult now to know whether Sir Oliver Lodge will be remembered in the years to come chiefly for his large contributions to physical science, particularly in the fields of radioactivity and atomic structure, or for his researches in the realm of psychic phenomena and for his efforts to establish the truth of immortality. Sir William Crookes, who first introduced the scientific world to a knowledge of electric discharges in high vacua and paved the way for a veritable Niagara of hitherto undreamed-of discovery, was also a psychic investigator and a staunch supporter of the spiritualistic conception of the universe. Lord Rayleigh, under whose direction Sir William Ramsay made his classic investigation of the rare gases of the atmosphere, was a devout follower of religion.

Turning to the men of science in our own country to-day, we can cite no more distinguished figure than that of Robert A. Millikan, winner of the Nobel Prize in Physics in 1923. Not long ago, he said: "Every one who reflects believes in one way or another in God." To him, it is "as obvious as breathing that every man who is sufficiently in his senses to recognize his own inability to comprehend the problem of existence, to understand whence he himself came and whither he is going must in the very admission of that ignorance and finiteness recognize the existence of a Something, a Power, a Being in whom and because of whom he himself lives and moves and has his being."

Doctor Millikan has also made a real contribu-

tion to the contemporary discussion of this subject by showing in his paper on "Science and Religion" that many of America's foremost scientists are earnest Christians. Among those he names are: Doctor Charles D. Wallcot, head of the Smithsonian Institution in Washington; Henry Fairfield Osborn, director of the Natural History Museum of New York and one of the foremost biologists and experts on primitive man in the world; Edwin G. Conklin, distinguished evolutionist of Princeton; John C. Merriam, president of the Carnegie Institution and our country's foremost paleontologist; Michael Pupin, whose book *From Immigrant to Inventor* has made him known to a host of readers; John Coulter, chief among American botanists; the eminent chemists A. A. and W. A. Noyes; James A. Breasted, leading archeologist of America; and C. G. Abbott, home secretary of the National Academy of Sciences and distinguished astronomer.

In 1923 a statement regarding the relation of science to Christian faith was formulated and signed by thirty-five prominent Americans, including fifteen scientists. Its concluding sentence reads as follows: "It is a sublime conception of God which is furnished by science, and one wholly consonant with the highest ideals of religion, when it represents Him as revealing Himself through in-breathing of life into its constituent matter, culminating in man with his spiritual nature and all his Godlike powers."

Doctor Henry F. Osborn, in his little book, *Evo-*



*lution and Religion*, says, "The moral principle inherent in evolution is that nothing can be gained in this world without effort; the ethical principle inherent in evolution is that the best only has the right to survive; the spiritual principle in evolution is the evidence of beauty, of order, and of design in the daily myriad of miracles to which we owe our existence." It is of the utmost significance, too, that Doctor Osborn, whose life has been devoted to the scientific aspects of life and Nature, should say, " . . . purpose pervades all Nature, from nebula to man. Herbert Spencer may call it the Unknowable; the naturalist with Wordsworth may call it Wisdom and Spirit of the Universe."

Professor Edward L. Rice, of Ohio Wesleyan University, in his address before the American Association for the Advancement of Science, in December, 1924, said: " . . . an increasing number of our leading scientists are publicly proclaiming their own theistic philosophy, and emphasizing anew the essential harmony of a progressive scientific belief with real religion. I rejoice in the public utterances of such men as Conklin, Coulter, Millikan and Osborn. May their tribe increase! And may their efforts combine with the increasing popular interest in science toward the bringing in of the day when a more scientific religion and a more religious science shall join in a common welcome to truth, whether revealed in Nature, in human life, or in the Bible, and shall present an unbroken front in the struggle for the higher evolution of the human race." \*

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\**Science*, March 6, 1925.

Doctor J. B. S. Haldane, eminent British scientist of the present day and author of *Daedalus*, states his belief in the spirituality of the universe in the following words: "God is with us, in us, and everywhere around us, as Jesus taught." No one can read the works of Doctor J. A. Thomson, the author of *The Outline of Science*, without knowing how deep are his convictions of the theistic origin and nature of the universe.

Professor Theodore W. Richards of Harvard, America's foremost chemist, has indicated his faith in the spiritual nature of life in the following lines taken from a Phi Beta Kappa address delivered by him at Cambridge in 1916: "There is, in truth, no conflict between the ideals of science and other high ideals of human life. With deep insight, a poetic thinker on life's problems, in the opening lines of a sonnet, has said:

Fear not to go where fearless Science leads,  
Who holds the keys of God. What reigning light  
Thine eyes discern in that surrounding night  
Whence we have come, . . . . .  
Thy soul will never find that Wrong is Right."

No, the pursuit of science does not destroy faith in God and religion and in the noble ideals of life. That some scientists are disbelievers, or agnostics, is no more significant than that many theologians have shut their minds against the revelations of scientific truth. A man may follow the path of truth wherever it may lead with the perfect assurance that he will find God at the journey's end.

Whatever unbelief may prevail to-day, whether it be religious or scientific, we may be perfectly sure that, somewhere, sometime, all will understand and that scientist and Christian prophet may unite in one purpose and a common faith.

THE END





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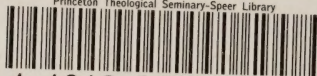
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